SCIENTIFIC AMERICAN

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THE ATLANTA EXPOSITION—THE WOMAN'S BUILDING.—[See page 375.]

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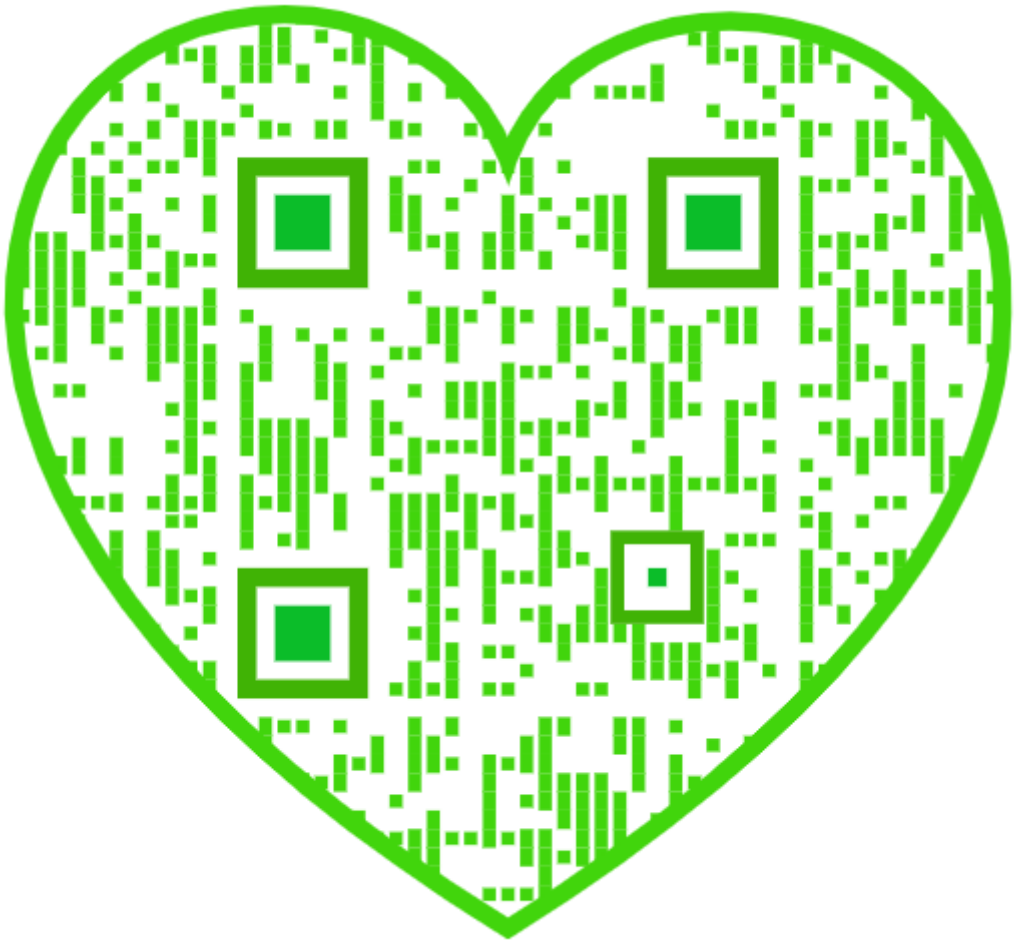

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THE MOTOCYCLE AWARD.

We learn from the Chicago Times-Herald that the judges made the following awards on December 5:

Gold medal won by Morris & Salom. Points—safety, ease of control, absence of noise, vibration, heat, odor, cleanliness, and general excellence of design and workmanship. Duryea, $2,000 (prize), first in race and compactness in design. Mueller, $1,500, second in race and economy. Sturges, $500; Macy, $500; Lewis, $200; Haynes & Apperson, $150; Max Hertel, $100; De la Vergne, $50.

The Morris & Salom "electrobat," which received the gold medal, is an electric carriage and was illustrated in the SCIENTIFIC AMERICAN for November 16, 1895. Only the Duryea and Benz-Mueller carriages went over the course. They are both propelled by gasoline. The Sturges machine is electrical, the Macy, Lewis, Haynes & Apperson, and the De la Vergne carriages are all run by gasoline. The Macy machine is more properly called the Roger machine. The Duryea, the Benz-Mueller, and the De la Vergne motocycles all carried modified Benz motors. The gold medal is very handsome. On the obverse side the medal bears a typical representation of a herald of the days of chivalry. Around the figure surrounding a background of rays is the inscription, "The Chicago Times-Herald Motocycle Contest, 1895." On the reverse, and surrounded by a wreath of bay leaves, is a winged figure of Victory, with pinions extended and holding on her left arm an oval shield, upon which will be inscribed the name of the winner. The medal is composed of 100 pennyweights of fine gold and is valued at $250. The judges of the contest were Prof. Barrett, C. F. Kimball, J. Lundie, and L. L. Summers. The preliminary arrangements were made by Mr. F. U. Adams, the manager of the motocycle contest.

Although the number of contestants in the race was small, still the contest has scientific value, on account of the elaborate tests to which the carriages were subjected, speed not being the only factor which was taken into consideration.

STRIKES IN THE UNITED STATES AND EUROPE.

We have before us the first number of the Bulletin of the Department of Labor, which is to be issued bimonthly in accordance with the law of March 2, 1895. In the preface the editor, Commissioner Carroll D. Wright, sets forth the aim and scope of this publication, as compared with the already existing Annual and Special Reports. It will contain "such matters as cannot in the nature of things find a place in the Annual or Special Reports; but it is confidently expected that, through the Bulletin, the department will be able to bring much of its work closer home to the people." Its aim will be "to furnish to the public" current "facts and information relating to industrial affairs which cannot readily be secured in any other way."

The first number, among other topics, deals statistically with the question of strikes and lockouts in the United States and in certain European countries.

These statistics cover a period of thirteen and one-half years, from 1881 to 1894. During this time there occurred 14,390 strikes, involving 69,167 establishments, and throwing out of employment no less than 3,714,406 employes. The quietest year was 1884, when there were 443 strikes affecting 2,367 establishments and 147,054 employes; the most disturbed year was 1886, when 10,053 establishments were involved and 508,044 employes thrown out of work as the result of 1,432 strikes.

The greatest number of strikes, 18,787, occurred in New York State; then come Illinois, with 12,828, and Pennsylvania, with 10,661.

Out of 69,167 establishments affected, about 90 per cent were in the following industries: Building trades, 26,860; coal and coke, 8,018; tobacco, 5,465; clothing, 4,769; food preparations, 3,817; metals 3,454; transportation, 2,805; stone quarrying and cutting, 2,461; and five others in proportions under 1,000.

During these thirteen and one-half years, 32 per cent of the whole number of people thrown out of employment by strikes succeeded in gaining what they asked; 12 46 per cent only partly succeeded; and 55·50 failed altogether

From the table marked "Leading causes of strikes" we learn that 42·32 per cent struck for increase of wages; 19·48 per cent for reduction of hours; 7·77 against reduction of wages; 7 59 for increase of wages and reduction of hours; the remaining 22 per cent of the strikes occurring for minor and very varied causes.

The tables from which the above figures are taken are very startling, and they will come as a revelation to many. But the most sensational figures are those which deal with the actual losses incurred during these thirteen and one-half years of strikes and lockouts. The actual wage loss of employes was $163,807,866. It cost the various labor organizations to assist the strikers $10,914,406. The loss to employers was $82,590,386. The corresponding losses due to lockouts were: Employes, $26,685,516; assistance by labor organizations, $2,524,298; employers, $12,235,451.

Summing up these figures, we find that the various labor disputes of the past thirteen and one-half years have cost the country no less than $298,757,923!

Statistics may be dry reading; but they are often, as in this case, very eloquent.

It is pretty well understood, both by capital and labor, that strikes and lockouts are a crude and costly means for the adjustment of employer's profit and employe's wage—but just how costly can only be realized when we look at the appalling loss that is spelled out by the nine figures given above.

The statistics for Great Britain and Ireland cover the five years from 1889 to 1893 inclusive. Of the 4,526 strikes which occurred, 3,428 were reported in detail. They affected 1,852,193 persons. The successful strikes affected 44·5 per cent of this total number; the partially successful 32·9 per cent and the unsuccessful 20·7 per cent. These figures would seem to indicate either that labor is less under the control of capital or that its organization is stronger in those countries than it is in the United States. This would seem to be further proved by the fact that in the three years 1891 to 1893 there were only 35 lockouts, as against 4,526 strikes in the five years 1889 to 1893.

In France during the years 1890 to 1894 there were 1,866 strikes, affecting 7,698 establishments and 500,475 employes. The average of successful strikes was 25·24 per cent; of partly successful, 29·26; and of failures, 44·64 per cent.

In Italy from 1878 to 1891 there were 1,075 strikes, affecting 254,668 employes. Of these, 24 per cent were successful; 47 per cent partly successful, and 29 per cent failed.

In Austria, during the year 1891 there were 104 strikes, affecting 1,916 establishments and 40,486 employes. Of the 104 strikes, 23 succeeded; 26 succeeded partly; and 51 failed.

Population of Canton.

The following particulars are taken from the North China Herald:

In a recent census taken by order of the viceroy at Canton, the inner and outer cities are shown to contain 481 streets and lanes, 24,962 houses, 233 temples, 107,035 males, and 53,975 females. The eastern suburb has 123 streets, etc., 7,627 houses, 61 temples, 23,738 males, and 14,812 females. The western suburb contains 875 streets and lanes, 43,942 houses, 226 temples, 192,249 males, and 87,355 females. The southern suburb contains 65 streets. 3,476 houses, 33 temples, 13,372 males, and 6,402 females.

Altogether there are 336,754 males and 162,544 females, 80,007 houses and 553 temples. There is also the boat population, which, sixty years ago, numbered 80,000, giving, at three persons per boat—much too low an average—a population then of 252,000. This number must be now largely increased, and 350,000 to 400,000 would probably be nearer the mark—children are not included probably. This brings up the population to 1,000,000 In sixty years this population should nearly have doubled itself, and the estimate now given by foreign observers is 1,800,000. A poll tax is levied on persons without house property, and there is a tendency to underrate the number of persons avoiding taxation. The great discrepancy between male and female population is noticeable. It is ascribed to the fact that the wives and families of most of the workers live in the neighboring country villages. The women live in cheap houses in the country, and the girls stay with their mothers till they are betrothed, and then go to their mothers-in-law. While men abound in cities, the village populations are chiefly female. Representative male heads of families live in the villages, and there is sufficient adult male labor to cultivate the fields. The brothers and sons go to the city.

Canton is a city of workshops, printers, carpenters, workers in lacquer ware, sailmakers, silversmiths, braziers, workers in ivory and tortoise shell, painters on glass, on paper, and on silk; glassblowers, firework makers, mat weavers, cloth weavers, embroiderers, paper makers, sugar refiners, fan makers, carpet weavers, makers of china ware, of grass cloth; and jade stone turners. Of all these trades, women only are engaged in embroidery. In addition, men in China cook, run errands, sweep floors, and wait at table. Women only do the washing; hence the marked preponderance of males over females in the city. It may be added that life in the country is much more moral than in the cities, chiefly owing to the family institution being in full operation in the villages.

A CAR load of redwood for use in making lead pencils was recently shipped from Sanger, Cal., for Nuremberg, Germany. Some time ago, experts from Germany investigated the timber resources of the Pacific coast in an effort to find a substitute for cedar, the forests in Europe from which the supply of that wood for lead pencils has hitherto been obtained having become almost exhausted. It is said that the redwood from the east slope of the Sierras is the only wood besides cedar with a sufficiently straight grain to make it suitable for pencils.

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Trolley Improvements Required.

We abstract the following from a recent address by Captain William Brophy, the veteran electrical inspector, before the Electric Potential Club:

I hold that all high potential circuits should be supported on wooden poles and cross arms, and the wires of all low potential circuits excluded from such poles; and I do not believe it best to place such wires on fixtures placed on roofs or other portions of buildings, but if they are so placed, they should be beyond the reach of persons standing or working on the roofs.

I believe the so-called insulating covering in use at the present time for high potential overhead circuits to be worse than a delusion and a snare. I believe it would be better to hang out the danger signal at once, by using bare copper wire, than to continue the use of this flimsy fraud that affords no protection to human life or property, but lures innocent people on to injury and death. Knowing the worthlessness of the material, it becomes necessary to use the best form of insulating supports. The present style of glass insulators is not what is required. Many of these insulators are only so in name. The very best grade of glass or porcelain should be used, and the double or single petticoat pattern, the form best suited to the purpose being that which will offer the greatest amount of dry surface between the wire and supporting pin. These insulators should be supported on wooden pins.

Iron poles on any part of high potential circuits should not be tolerated in any civilized community. They are a relic of barbarism that should be relegated to the scrap heap, and any attempt to patch them up only serves as a thin disguise to the danger that lurks within them. Twenty five to 40 feet of wood between the iron and the ground means that much insulation, while 100 feet of iron only means what the glass insulator, wooden pin and cross arm afford. The waste of energy due to the iron poles on the long circuits on which are placed 125 iron lamp poles is simply enormous—so great that in rainy weather such circuits have to be cut in halves in order to send sufficient current through the lamps. Where such circuits are placed on the modern iron and steel structures, they become a source of danger to persons who have occasion to handle these or other wires on the same or other fixtures. Such circuits should not be run between the branches or through the foliage of trees, but when it cannot be avoided the highest class of insulated wire should be used, and this incased in lead or iron. Any attempt at protecting this insulation from abrasion by covering it with tape or cotton braid is useless.

All that I have said up to this time applies with equal force to direct and alternating current circuits; but there are certain features of the latter that require separate treatment.

As you know, a difference of potential of one, two or more thousand volts exists throughout the entire length of the primary circuit and between it and the earth, so that the danger from derived circuits to ground or from one side to the other is the same at a point one or more miles distant from the dynamo as it is at the brushes. Again, it is necessary for electrical and other reasons to run the wires in parallel and close together, in order that no other wires can be placed between them, and for convenience in making connections to the different transformers. Workmen and others can hardly pass between them without coming in contact with both of them, and for this reason I consider them far more dangerous than high potential series arc light circuits. As before stated, the covering of these wires affords little or no protection to those persons in dry weather, and none whatever during or immediately after rain storms.

If these circuits are to remain above ground, they should be separated so that both cannot be reached at the same time by any person; but this would involve the changing of nearly every existing circuit and a considerable increase in the cost of constructing new ones. Rather than adopt this plan a high grade of lead-covered insulated wire should be used, and when that is done the proper place for them is underground.

What Happens to the Carbon in the Arc Light?

The electric arc light, with its intense, steady brilliancy, is now so familiar an object that few stop to think how wonderful a thing it really is. Here is light enough to illumine many square yards nearly as well as daylight does, proceeding from the points of two little carbon rods as large as one's little finger. What is the state of the carbon in that small spot? Prof. S. P. Thompson, in a recent Cantor lecture before the Society of Arts in London, tells us that it has actually melted there, something that was until recently thought impossible. Moreover, he says that when the light hisses, the liquid carbon is really boiling. The facts that lead him to these conclusions are quoted below from the report of his lecture that appears in Industries and Iron (London, November 1), condensed for the Literary Digest:

"Captain Abney had found the white surface of the luminous crater to be always of an equal degree of whiteness, which obviously means that it is always of an equal degree of temperature. . . . The only thing that could account for there being a fixed temperature for the crater surface was the fact that carbon is at the surface in a state of volatilization; that the carbon is evaporating off from the positive carbon into the arc or flame. At that surface you necessarily must have the temperature at which carbon evaporates, just as you cannot have the surface of ice under ordinary conditions either hotter or colder than the temperature which is taken as zero of the Centigrade scale. . . . My present view of the physical state of the arc crater is that the solid carbon below is covered with a layer or film of liquid carbon just boiling or evaporating off.

"When hissing takes place, a new state of things is set up. If you watch a short, hissing arc, you will see a column of light concentrating itself on a narrow spot, and the spot keeps moving about, and is very unstable in position as well as in the amount of light it gives out. The contracted spot from which light seems to start pits deeper into the carbon. . . . Mrs. Ayrton . . . made the observation that the crater surface, after the arc has been hissing, is found to be literally honeycombed. When the arc is hissing you can see little bits erupted out, and the hissing seems to be comparable to the hissing which takes place in water just when it is beginning to boil. If you have some water being heated in such a way that there is not more than a certain quantity of heat given off from the surface, you have the water evaporating quietly, but you cannot get more than a certain quantity of heat given off per square inch of top surface of the water in that quiet way. If you force more than a certain quantity of heat to pass off per top square inch of the water, you find the water begins to break up internally, and you have bubbles formed below the surface; the surface breaks up, the bubbles are thrown out, and you have a noisy phenomenon. I think you will find there is exactly the same kind of difference between the silent arc and the hissing arc as between quiet evaporation and a noisy boiling. There is a sort of decrepitation, as though solid particles were being torn asunder to make way for something coming out, when the arc is hissing."

Car Coupler Patents.

The Railroad Gazette gives the following: "A decision of some importance was recently rendered in the United States Circuit Court, Northern District of New York (Judge Coxe), in the case of the Gould Coupler Company against Pascal C. Pratt and others (Pratt & Letchworth). The suit was for infringement of the Browning & Barnes patents (owned by the Gould Company) by Pratt & Letchworth in manufacturing the Pooley coupler. The Browning claim in question was for the means of automatically opening the hook (knuckle) and holding it open, in proper position for coupling. The decision is that the Browning patent is valid in the broad claim not only of the specific means described but of any means for automatically opening the knuckle and retaining it open in the coupling position. The Pooley device is clearly an equivalent for the means described in the Browning patent. Browning used a spring and Pooley used a lever, but it is quite immaterial whether the knuckle was opened by a spring, or a lever, or a spiral incline.

"The point is that the Browning patent is good for any means which accomplish the results; but it will be observed that these results are automatically opening the knuckle and keeping it open, and it must be kept open by some other force than inertia or friction. Therefore, the judge says specifically that a device which will automatically open the coupler but does not keep it open may be used without infringing. The court does not define strictly what would constitute automatic opening. It will be seen, therefore, that the Browning claim is pretty strictly limited. The court says that it would not have been so limited if Browning had had the assistance of an experienced solicitor; that is, he would probably not have coupled the opening and the retaining features together and made them vital parts of one claim. Thus it becomes impossible for the court to give the patentee the full benefit of his invention. In the matter of the Barnes patent, it is held that the Pooley coupler does not infringe. The complainant is entitled to a decree for an injunction and an accounting, based upon the claim of the Browning patent; but as the claim under the Barnes patent is not sustained, the decree does not carry costs. We should suppose that this decision would have one very important result—to spread the idea that there are some coupler patents that are worth something.

"The St. Louis Car Coupler Company brought suit in a United States Circuit Court against the Schickle, Harrison & Howard Iron Company, and the suit has just been decided in favor of the complainant, the decision being written by District Judge Adams. The complainant employed the defendant to make about 1,000 couplers under patents owned by the complainant. The order was filled and then the defendant continued to make and sell knuckles of the same form. The Schickle, Harrison & Howard Company claims that it can lawfully make and sell these knuckles to purchasers of the complete coupler who may need them for repairs. The decision is that the patent is a combination patent, including the drawhead, the knuckle and the locking pin, and that the knuckle is the important feature of the combination.

"There is no question as to the validity of the patent; the only question is whether or not knuckles made and sold as has been done by the defendant are repairs within the meaning of the rule which entitles the purchaser of a patented article to repair it when worn out. It is held that a purchaser of a patented article may use it until it is worn out and repair and improve it as he pleases, provided the repair and improvement do not amount to a reconstruction. In the present case the court holds that the knuckle is the chief element in the patented combination and that the use of it to supply the place of worn-out knuckles amounts to reconstruction and is not repair. The decision then is that the defendant infringes and an order may issue for an injunction and accounting."

Meeting of the American Society of Mechanical Engineers.

The sixteenth annual convention of the American Society of Mechanical Engineers was opened December 3 in the society's rooms at 12 West Thirty-first Street, New York City. A large gathering of members greeted Mr. C. E. Billings, the president, when he called the meeting to order. Papers were read on "The Recent Improvement of the Drop Hammer for Forging" and "The Best Material for Filtering Oil, Either for One Operation or in a Series, and the Best Method for the Extraction of Oil from Condensed Steam Where it is Desirable to Use the Exhaust Steam for Boiler Feed Purposes." On the morning session of December 4 the following officers were elected: President, John Fritz, of Bethlehem, Pa.; vice-presidents: F. H. Ball, of this city; Jesse M. Smith, of Detroit; M. L. Holman, of St. Louis; George W. Melville, of Washington; Charles H. Manning, of Manchester, N. H., and Francis W. Dean, of Boston; managers: John B. Herreshoff, of Bristol, R. I.; L. B. Miller, of Elizabeth, N. J.; W. S. Russel, of Detroit; John C. Kafer, of this city; Charles A. Bauer, of Springfield, Ohio; A. C. Walworth, of Boston; Norman C. Stiles, of Middletown, Conn., and George W. Dickie, of San Francisco; treasurer, William H. Wiley, of New York City.

The officers were elected unanimously.

The committee on testing the resistance of fireproofing materials reported progress. The committee intends to build a furnace about the size of a room in an office building, and to lead into the furnace hot burning gas, so as to determine the effect of these temperatures on the various materials which are used to fireproof the iron and steel put in modern buildings. The furnace will be erected on the ground of the Continental Iron Works, at Greenpoint, L. I. A petition to the Paris Exposition of 1900 addressed to Congress was also read, as well as the report on the Zurich Conference upon the unification of methods of testing the materials of construction. Various other papers were read. The closing session was well attended and was mostly devoted to the reading of papers and to discussions. A picture of Ericsson, the inventor of the Monitor, was presented to the society by Prof. F. R. Hutton, the secretary. Mr. Hutton discovered the picture in an auction room on Fifth Avenue. A member of the society said he had seen it hanging on the walls of Ericsson's home when the inventor was alive. The drawings of the steamboat Fulton, made by Robert Fulton in 1813, which, for many years, were in the possession of the Schuyler family of New York, were offered to the society by Miss Louisa E. Schuyler, of Gramercy Park, New York City, and were placed to the right of the president's desk. There is also in the society's room a picture of Robert Fulton, painted by himself, with the aid of a mirror. The society has also a Colonial mahogany table which was owned by him, and on which he is believed to have made the drawings of his steamboat.

A reception and supper at Delmonico's was held on Thursday, December 5. At the closing session, held on December 6, it was decided to hold the summer meeting of 1896 in the city of St. Louis, Mo. Part of each day of the convention was devoted to an inspection of various objects of interest in the city and immediate neighborhood.

Colored Glass Plates.

Glass is cast upon a table and a second layer of glass of a different color then cast upon the first, the thickness of each element of the compound sheet being determined by the vertical height of its allotted roller, by the traverse of which the plastic mass is spread. Designs may be impressed upon the glass through one or more of the several layers forming the compound sheet. The designs are produced by the use of a descending plate bearing the device desired and moving with its lower face strictly parallel to the table. The designs may extend completely through the sheet of glass and the recesses produced may be filled in with colored enamels.—T. Lefévre and L. Michau, Paris, France.

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A MONUMENT TO ERICSSON, FILIPSTAD, SWEDEN.

In the little town of Filipstad, thirty-five miles northeast of Carlstad, Sweden, in the mountainous country bordering on Norway, was recently unveiled a monument to John Ericsson, forming the subject of our illustration. The imposing ceremonial with which, in August, 1890, the remains of this distinguished engineer were transferred from America to Sweden will be at once recalled, with thoughts of the splendid achievements which have associated his name with so much that has been accomplished during the present generation. The body was conveyed from the land of his adoption to that of his birth by the United States war ship Baltimore in a way befitting the illustrious dead, and Sweden received the dust of her distinguished dead with all possible honor, erecting over it a mortuary chapel of unusual beauty, the emblematic design of which gives the key to the life of him who rests beneath.

For the photograph illustrating the scene of the unveiling we are indebted to the Illustrated American, and in the accompanying article by Florida Stephenson Sharpe, it is stated that "the memorial is built on a great terrace in the cemetery of Filipstad. The terrace is surrounded by granite pillars that are strung with heavy iron chains. Broad steps lead up the terrace to the portals. Crowning the monument is a globe of copper on which a great eagle stands, the claws clutching America, the wings outspread, while the beak is offering an oaken branch to Sweden. This design is very conspicuous. Below the globe the granite roof is built in several buttresses. The western wall is almost entirely taken up by the broad portal, surrounding which is a great shield. This shield is of copper, a propeller in bass-relief thereon, oaken leaves and fir branches surrounding the shield. The corner pillars are emblazoned with the arms of 'Ivea' and 'Gota' respectively. Over the arch runs the inscription, 'The Fatherland to John Ericsson.' The interior is rich in sculptured design and unique ornamentations. The sarcophagus proper, occupying the center of the chapel, is of green marble, in which the coffin is placed. Over the entrance of the interior of the chapel one reads this inscription sharply chiseled in the stone: 'This structure was erected in the year 1895, in memory of John Ericsson."

A CLOTHES RACK FOR HOUSEHOLD USE.

The illustration represents, in folded and open position, a light and strongly made clothes horse or rack, designed to occupy in either position the least space necessary for a thoroughly practical article. It has been patented by William A. Bode, of Orange, N. J. Within the central post slides a rod conveniently adjustable at the desired height, and carrying on its upper end a series of pivotally connected umbrella-like clothes-supporting arms, each arm being separately adjustable to an outwardly extended position. Pivotally connected to the central post are also folding frames with horizontal bars, forming a clothes horse or rack at each side for supporting large pieces of clothing. Each side frame is inpendent of the other, so that either one or both of them may be used at a time, or both of them may be hooked up and held in raised position, using only the umbrella-like clothes-supporting arms at the top, and leaving a clear space all around to the floor, these features rendering the device very advantageously adjustable where it is desirable to economize space and where large pieces have also to be handled.

BODE'S CLOTHES RACK.

Remedy for Nosebleed.

Dr. T. A. Hall writes as follows: I read an account in the Petersburg Index Appeal of the death of a young man, a student at the University School (McCabe's) from epistaxis, who had eminent medical attention, but death ensued in spite of all that was done.

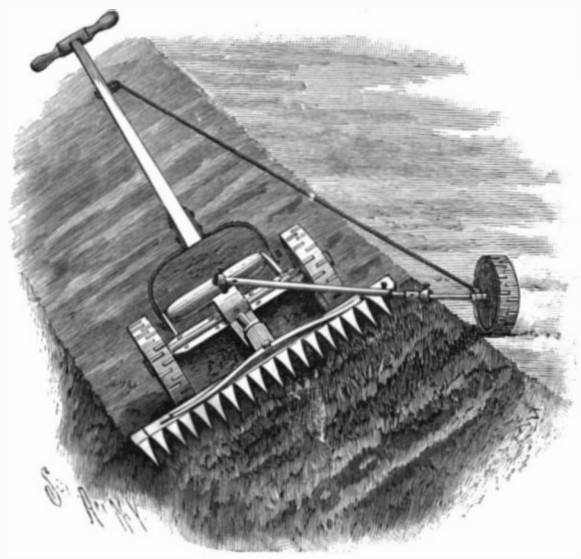
I write only to say that during a practice of fifty-one years I have had much experience in such troubles where death seemed imminent, and all the usual remedies failed to give relief, until a very ignorant person told me on one distressing occasion of a whole night that if I would get some "devil's snuff," a species of mushroom—fungus, Myces (F.)—it would give relief. I did so within an hour after the information, and the effect was wonderful. The powder was snuffed up the nostrils and the bleeding ceased as soon as contact was made with the point of bleeding. I have used it repeatedly, and have never been disappointed.

The plant comes on thin soils by the roadside and in the vicinity of decaying oak stumps, growing flat on the surface of the ground, sometimes in patches of a dozen in a small space about the size of a walnut. In the fall it begins to dry, and when dry, you may tread upon it and a profuse cloud of dark brown snuff is puffed up from the top of the fungus.

I have known of this plant all my life, but never thought to write about it till I read about the death of the young man alluded to above. I do not know the why, but do know the fact as stated.—Virginia Medical Monthly.

AN IMPROVED LAWN MOWER.

The machine shown in the illustration is adjustable to travel longitudinally of a terrace as well as transversely, evenly cutting grass of any height with one cut, and the driving mechanism of the mower is protected from dust. The improvement has been patented by William J. Rusk and Chester L. Holloway, of Hunter, N. Y. The ground wheels are loosely mounted on the axle, but a clutch causes the axle to turn with the wheels when the machine is pushed forward, the axle not revolving when the machine is drawn backward. A sectional frame incloses the axle and a forwardly extending drive shaft, the latter being connected by a gear with the axle within a central casing, and a hanger at the forward end of the frame carries in horizontal position a fixed knife with pointed teeth, the knife being strengthened by an arched base. Directly upon the upper face of the fixed knife a second knife is held to be reciprocated by means of a cam on the forward end of the drive shaft, the cam engaging a groove in the rear face of a central standard on the knife. Connected with the central casing on the axle by a ball socket is a telescopic arm, to whose outer end is connected, also by a ball socket, an auxiliary axle having at its outer end a small ground wheel, this device being detachable from the body of the machine, but being designed to adapt it especially for use in mowing longitudinally upon a terrace, as shown in the illustration. Arms projected rearwardly from the axle frame carry a roller, and the handle by which the machine is propelled is connected by a yoke with these arms.



RUSK AND HOLLOWAY'S LAWN MOWER.

UNVEILING A MONUMENT TO JOHN ERICSSON AT FILIPSTAD SWEDEN.

Eruption of Mount Vesuvius.

A dispatch from Naples dated Dec. 3 says that Mount Vesuvius is in a state of eruption. Three distinct torrents of lava are flowing from Atrio del Cavallo, burning chestnut groves along their path and falling into the Vetrana precipice, between Monte Somma and Colline del Salvatore.

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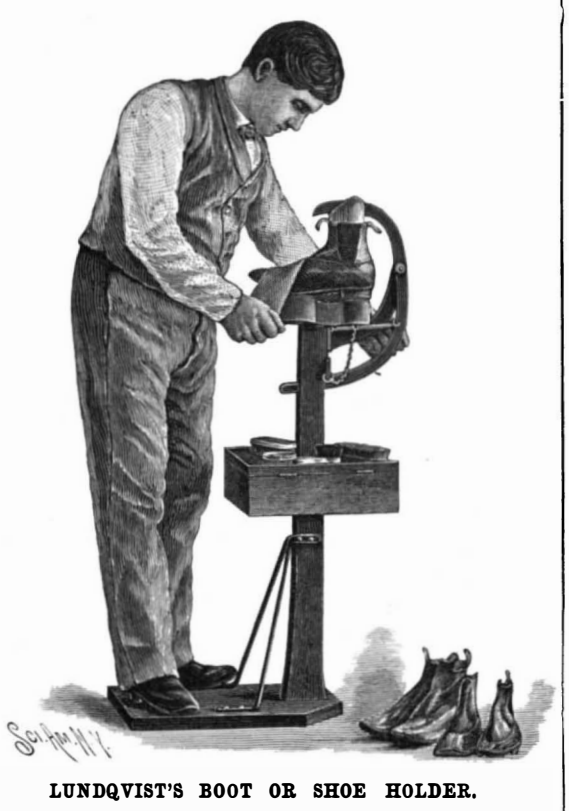
A HOLDER TO FACILITATE WORK ON BOOTS OR SHOES.

The tedious and tiresome work of cleaning and polishing boots and shoes may be greatly facilitated, and the task rendered much easier, by the simple and novel apparatus shown in the accompanying illustration. For this improvement patents have been granted in the United States and Canada, and in the principal European countries, to Richard Lundqvist, of Laguna de Terminos, Mexico. It consists of a stand carrying a post on whose upper end is a rubber-faced block shaped somewhat similar to a foot, on which may be placed a shoe with a last inside, there being in the top of the last a longitudinal recess or slit adapted to be engaged by the overhanging upper end of a pivoted lever, whose lower end passes through an opening in the post. A spiral spring normally holds the lever out of contact with the last, but when the lever is moved into engagement with the top of the last, it is thus held in locked position by means of a wedge, holding the shoe firmly against the block and permitting the operator to use both hands in his work. The operator is also thus enabled to employ his strength to the best advantage with the brushes or for the after polishing with the woolen cloth, the heat generated by the friction of which is designed to soften the hardened fatty matter in the leather and contribute to its durability and the comfort of the wearer. A smaller block is placed on top of the larger one when ladies' and children's shoes are to be polished. It is not designed that the last shall fit very snugly in the boot or shoe, so that a large and a small last will answer for a considerable range of sizes, the boot or shoe, where necessary, being partially stuffed with rags, paper, or other soft material to make a sufficiently good fit. Upon the post is also fixed a box with hinged covers, in which may be kept the lasts, blacking, brushes, cloths, etc.



LUNDQVIST'S BOOT OR SHOE HOLDER.

THE ART OF HORSEBACK RIDING.

Capt. J. B. Dumas, at our request, has been kind enough to send us a very interesting note upon the method that he employs in his teaching at the High Riding School. We reproduce it:

"My object," says he, "has been to realize by a succession of images that photography renders indisputable a monograph annotated, figure by figure and point by point, with all the gaits and all the paces of the High School. Placed in the center of the arena with my pupil, I secure by photography the precise time that his inexperienced or powerless eye has not completely seized. I make him see it; I explain it to him: (1) from the view point of quadrupedal locomotion; and (2) from the more important view point of the use of the horse for riding. These lessons do not go without a com lete revision of all the existing works upon locomotion passed through the sieve of a very long experience with the horse and completed by entirely new researches. I wish to say that I was the first to study and point out the influence that declivities exert upon the gait of the horse that moves thereon. I have deduced therefrom two rules: tendency to a lateralization of the gait in descents and a tendency to diagonalization in ascents. The conclusions are deduced of themselves to the end of improving the gaits of lateral form and those of diagonal form. I have, in fact, made a thorough comparison of the pace and the gallop, and concluded that, as regards forms and the kind of equilibrium engendered, these two gaits are sisters, and, all other things in time and space being equal, produce identical results in the emphasizing of the supercharge of the shoulders and the bearing down of the horse. These are the gaits of lateral form. On the contrary, I have found that the gaits of diagonal form, such as the trot, ease and raise the horse by facilitating the transfer of the weight to the hind quarters. These are two points to be noted and borne in mind in training, according to the individualities considered (man or horse) and the necessities to be satisfied.

"Finally, the beginning and end of all my system of training is summed up in one rule of the simplest character, in one sole principle for the rider: Act with the leg on the same side and at the same time as the anterior of the animal that is posing, the end of the horse's nose pointing in the direction of the motion to be begun. This is as much as to say: require of the animal an oblique or lateral motion only when his anterior, raised in the direction of the motion to be begun, permits him to execute it. This corresponds to the instruction given the foot soldier: turn on the side of the anterior raised or carry the weight of the body upon the leg that does not begin the motion, and carry it afterward in the direction of such motion, in order to extend and amplify it. This simple rule leads to correct turns without resistance or revolt, to the Spanish pace, to the prance, to starts at a correct gallop, etc., and, in a word, to correct riding in all the gaits and paces of the High School, and to the rapid training of the horse."

We accompany this interesting dissertation with some specimens of the photolithographs that illustrate the Album de la Haute Ecole, recently published by Captain Dumas and Viscount Ponton d'Amercourt. Figs. 1 and 2 reproduce exercises that are very difficult of execution, and which denote great skill upon the part of the rider. Figs. 3 and 4 show times of the great elongated trot and the racing gallop. Fig. 5 gives the work upon a declivity, useful to Alpine hunters. Fig. 6 shows the cabriole, an exercise that can be performed only by first-class riders.

We shall now examine with the authors one question, and that is the utility that these documents present from the view point of the artistic reproduction of animals in motion.

An experienced eye succeeds in seizing the impression of an action whose duration is not less than one-sixth of a second. Further, in order to succeed in this right along, it is necessary for it to have recourse to the utilization of the luminous impression upon the retina.

The observer should attentively follow with his eye the horse in motion at a distance of 100 or 150 meters, and then, immediately after the rapid execution of the time of the motion that he desires to study, he should abruptly close the eyes. The organs of external sight, had he not thus momentarily arrested their operation, would have continued to register the different periods of the acts of locomotion in measure as they were executed while rendering account of themselves to the mind, so to speak, only every sixth of a second; that is to say, in grouping them more or less. It would, therefore, have been able to succeed in seizing a clear image of the decomposition of the motion; but the retina, owing to the persistence of the luminous impression, momen

Fig. 1.—SYNCHRONOUS MOTION OF FORE AND HIND LEGS DIAGONALLY WITHOUT ADVANCING.

Fig. 2.—INSTANTANEOUS HALT IN PARADE.

Fig. 3.—GREAT ELONGATED TROT.

Fig. 4.—RACING GALLOP.

Fig. 5.—UPHILL WORK.

Fig. 6.—THE CABRIOLE.

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tarily preserves the interior registering of the last act that strikes it, and the observer will be easily able to find this vision there.

At the same distances of observation, or at distances that may be less, photography, on the contrary, very exactly retains the definition of a movement that is executed in less than one twenty-five thousandth of a second, if need be. It results that, with respect to the latter, the human mind scarcely conceives of anything more than a union of motions—a synthesis, because the instrument at its service, the eye, permits it to see merely a grouping and not to decompose them habitually. Besides, the education of the eye by the works of the majority of painters and sculptors, almost all of whom still work upon conventional types as yet little studied, causes it to retain and understand merely conventions as destitute of truth as a representative alphabetical character could be.

Photography, on its side, registers an analysis that takes from the imagination all idea of a motion in course of execution, since the exact conception of the latter can result only from a limited succession of true positions, fused by art into a single image.

As regards the definition of the motion by the image, the eye and photography, therefore, see equally false; the first, the eye, the tool of synthesis, because, in the first place, it sees badly for want of education and training, and, second, because it sees at once too large a number of successive phases in the series of a same motion, and mixes them with each other; the second, the analyst, that is to say, photography, because it sees too quickly, and consequently seizes at once too little of the series of this same motion to allow the human mind to afterward see in these images a close relation with what the eye has made it see.

It will be concluded from this that the representation of very rapid motions, which our eye sees badly, should, in order to be true from the view point of the human mind, take account of the manner of seeing and the eye's capacity for registering, as well as of the precise data furnished by photographic analysis. A fusion between these documents, under the dominant idea that they are destined to be appreciated by the human eye, is therefore necessary, and it is here that art must intervene. Photography will furnish the latter simply, with documents of exploitation, data whose strict reproduction would be as false from the view point of the eye as ugly from the view point of art. But we must hasten to add that the human eye, imbrued for centuries by the works of artists and by itself, if it preserves a just feeling of what is adapted to it, has not yet obtained its education. It now likes and appreciates only the illusions concordant with the conventions that it knows, that it has alone retained and that it believes in good faith to see and to find again in reality.

It is therefore necessary to train it and exercise it to see more accurately, more truly, and art must impose its rule, so that new and true synthetic conventions shall finally replace the ancient and false ones. The reproduction, by quadrupeds in motion, of the figures that the latter have engendered will always, in fact, present for the majority of them the capital defect of corresponding to none of the times of any motion whatever and of being materially irrealizable.

It may therefore be foreseen that the simple types that art will retain for the representation of gaits will result from complete knowledge, and then from the fusion of the images in series furnished by photography. In its study of nature, it will take them as guides for better interpreting the acts of motion.—La Nature.

Fires in "Sky Scrapers."

At a recent fire the Chicago firemen demonstrated at the Masonic Temple their ability to cope with fires in the upper stories of the tallest buildings. Engine No. 1 of the city fire department pumped a stream of water through 500 feet of hose and standpipes to the roof of the building, where there was sufficient force to drench the roofs of neighboring buildings. The water pressure at the engine was 240 pounds. On the roof at the same time the pressure was 54 pounds to the inch.

The length of the standpipe from the ground to the roof of the Masonic Temple is 323 feet. The sight of an engine and firemen at this sky scraper attracted a crowd of people who were well soaked for their curiosity.

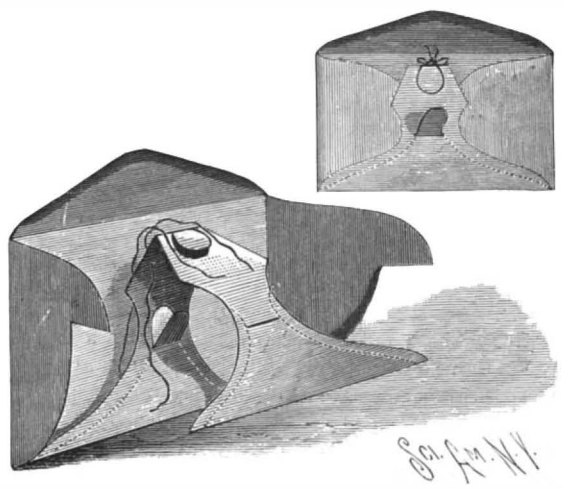
The result of the test was gratifying to Chief Swenie of the Fire Department and to the insurance men present.

Cracked by Earthquake.

One effect of the recent earthquake in Cincinnati and the surrounding country is just coming to light. Notwithstanding the recent heavy rains, it has been discovered that many cisterns are still as empty as during the long dry spell. Investigation shows that the cement was cracked in hundreds of cisterns, rendering them practically worthless.

A REINFORCED ENVELOPE.

An envelope having a reinforce or attachment applied at its back, for the securing of money or valuable papers in the envelope, and to facilitate opening it, is shown in the accompanying illustration. The improvement has been patented by John F. Forsyth, and is being introduced by Forsyth, Fields & Company, of Bloomington, Ind. The body or main part of the envelope is made in the usual way, but the side flaps fold and are gummed over the bottom flap, and a reinforce of similar form to the bottom flap is made integral therewith, folding back from its top edge, as shown in the larger view, and adapted to be sealed down upon the side flaps. In the reinforce is a transverse slot which receives a tongue projected through it from the inner flap, this tongue constituting a pull



FORSYTH'S ENVELOPE.

piece for tearing open the envelope on lines of perforation indicated by the dotted lines. A small gummed flap at the middle of the reinforce is adapted to receive and be sealed upon the tied ends of a tape or string with which money or papers in the envelope may be bound.

Oil Prospectors on the Jordan.

According to consular reports, it is the intention of the Turkish authorities, at Jerusalem, to establish a steamship line on the Dead Sea. The existence of asphalt in that region has been ascertained, and it is supposed that petroleum will be found also. A rational development of the Jordan Valley from Lake Tiberias down, and especially the opening up of the rich mineral resources of the Dead Sea basin, is considered a very profitable undertaking, for which, however, foreign capital will hardly be found, as the legal status of property holders in those regions is very unsafe.

AN IMPROVED TELEPHONE TRANSMITTER.

The illustration represents different forms of telephone transmitters for which two patents have recently been granted to Ignatius Lucas, of Passaic, N. J. The improvements are designed to soften the sounds for transmission, and render them uniform and perfect, even if the transmitter is located in a building where there is much noise and jar. As shown in Figs. 1 and 2, the transmitter has the usual casing, and the diaphragm has a point engaging the upper contact disk, made of carbon, and placed opposite a

LUCAS' TELEPHONE TRANSMITTER.

lower disk, but both disks are embedded in a filling of loose material, preferably of sliver, or wool as it leaves the carding machine and previous to being felted. The filling is preferably held on a false bottom plate adapted to be adjusted until the desired sound quality is obtained. As shown in Fig. 3, the disks or buttons are similarly embedded, but between them are placed a doubled up sheet of conductive material, such as wire netting, coated on its surface with granulated carbon, the carbon surface being in contact with the inner surfaces of the buttons. Fig. 4 shows a sheet of this material, the granulated carbon being attached in an even layer by a suitable adhesive, such as collodion.

Rose from the Ranks.

Mr. Chauncey M. Depew lately visited the Mechanical Department of Cornell University. He found at the head of it Professor Morris. The latter claimed him as an old acquaintance.

"How's that?" said Mr. Depew.

"I used to work for the New York Central Railroad," was the professor's answer.

"Indeed! in what department?"

"Oh, just in the ranks."

"How did you get on there?" asked Depew.

"I was first a fireman on an engine. That was a tough job, but it led up to the position of engineer. I made up my mind to get an education. I studied at night and fitted myself for Union College, running all the time with my locomotive. I procured books and attended as far as possible the lectures and recitations. I kept up with my class, and on the day of graduation I left my locomotive, washed up, put on the gown and cap, delivered my thesis, and received my diploma, put the gown and cap in the closet, put on my working shirt, got on my engine, and made my usual run that day."

"Then," said Depew, "I knew how he became Professor Morris."

That spirit will cause a man to rise in any calling. It is ambition, but it is ambition wisely directed, seeking to make one's self fitted for higher work. When this is accomplished, the opportunity for higher work is sure to come.

A Fire Ball.

A recent number of Nature gives the following:

In compliance with a wish expressed by several scientific friends, I place on record an instance of damage done by a fire ball or globular lightning. About five weeks ago, when I was in Londonderry, the circumstances were related to me by Mr. James Harvey, of Northland Road in that city. Mr. Harvey was staying during the month of August at Culdaff, on the north coast of Donegal; and on the 24th of that month, at about 4 P. M., a little boy named Robert Alcorn, whose parents occupied a house near Mr. Harvey's, was desired by his father to go into the yard and drive away some fowls from the door. On going out of the house, the boy saw a large bright object in the sky about the size of the table in his bed room (I give his own account, leaving out necessary considerations of distances, etc.), or apparently about six square feet in area. The object came toward his house from the west or northwest; and when it came close, it partly burst with a report like that of a gun. He put his hands over his face to shield himself from "the spark," and after the explosion the bulk of the ball appeared to continue its course toward the east, low down. When it burst, however, it struck him, shattering the thumb and the first and second fingers of the left hand, cutting, scratching and blackening the right hand and left cheek, and shattering into fragments several bone buttons on his coat. Very soon afterward, Dr. R. Young, of Culdaff, and Dr. Newell, of Moville, attended the boy, and amputated the fingers and a portion of the thumb.

No one near the place saw the ball (except the boy, of course), but the parents and several others heard the report, and the boy's father rushed out immediately and caught his son as he was falling. Mr. Harvey soon afterward examined the place, and could find no further trace of the fire ball, except that a piece of bark had been knocked off a small tree within a few feet of the place where the boy was struck. The local police made exhaustive inquiry as regards the possibility of any one's having fired a gun at the boy, or of his having had any explosive in his possession; but nothing of the kind transpired.

It is well to add that at Redcastle (about eight miles away), one of the residents saw, on the same day, a bright object in the sky, which object he took to be a fire ball. The day was stormy, with heavy showers, but no thunder.

M. Jamin relates ("Cours de Physique," tome premier, p. 470) several instances of globular lightning, and from these I select the following as bearing, perhaps, the greatest resemblance to the above case as regards atmospheric conditions:

"A la suite d'un violent orage observé près de Wakefield, le 1er mars 1774, lorsqu'il ne restait plus dans tout le ciel que deux nuages peu élevés au-dessus de l'horizon, M. Nicholson voyait à chaque instant des météores semblables à des étoiles filantes descendre du nuage supérieur au nuage inférieur."

October 28. GEORGE M. MINCHIN.

The Fastest Regular Train in the World.

The Empire State express now holds the world's record as the fastest regular passenger train. The speed of the best trains of foreign nations is: England, 51·75 miles per hour; Germany, 51·25; France, 49·88; Belgium, 45·04; Holland, 44·73; Italy, 42·34; Austria-Hungary, 41·75. America now heads the list with 53·33 miles per hour to the credit of the Empire State express. This is the speed now made between New York and Buffalo.

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THE WOMAN'S BUILDING, ATLANTA, GA.

The building represented in our illustration is by far the prettiest structure in the Cotton Exposition grounds. Classic in its design, the Woman's building is the one object that attracts the attention from any point of view taken from the terraced heights. It is unlike the larger structures in that it is divided into stories; the first or ground floor being used as an emergency hospital and kindergarten, the main floor with broad hall and stairways leading to a third floor above. The three stories or floors are subdivided into rooms, and in these are displayed the handiwork of women, in painting, etching, architectural designs, embroidery and many works requiring delicacy of touch united with skill and taste in execution.

The building is 150 feet by 128 feet and was designed by Elise Mercur of Pittsburg, Pa. Our illustration was taken from the landing of a flight of steps leading to the Plaza; statues of heroic size ornamenting the balustrades.

Science Notes.

New Process of Tanning.—In order to hasten the process of tanning, says the Revue Scientifique, Messrs. Bake and Leverett pass a current of hydrogen gas or a current of some gaseous compound of hydrogen containing a certain quantity of arsenic through the liquid in which the hides are immersed. They obtain the hydrogen either from the action of commercial sulphuric acid upon zinc or iron or from that of steam upon iron. They calculate, in fact, that in this case the hydrogen obtained will contain a sufficient quantity of arsenic. The gas, collected under pressure in a gasometer, is introduced into the bottom of the tanning vat through a pipe provided with a series of apertures. After bubbling up through the liquid it flows out through another pipe affixed to the cover of the vat. Vats of very large dimensions are employed, and the tanning proceeds very rapidly.

A New Asphalt Beton.—The Austrian Militair-Comite has been testing a new asphalt beton introduced under the name of "Lavoid beton," and recommended principally because it hardens quickly. It is an earthy brown powder, which has a slight odor of tar and consists mainly of sulphur and iron slag. The analysis made in military laboratories yielded: Sulphur, 33·53 per cent; tar, 8·21; iron slag, 57·83; and water, 0·43. The iron slag contained: Silica, 43·01 per cent; ferrous oxide, 22·42; alumina, 30 9; and lime, 4·16. The hardening is ascribed chiefly to the formation of an iron sulphide, the tar acting as a reducing agent. From this point of view, the silica, clay, and lime would be useless, though they might combine at a slower rate; the committee, however, styles them impurities simply. For the tests, plates of from 3 to 6 inches square were formed by pouring the melted lavoid over heated small granite. The material proved quite brittle and not able to resist blows, but was found to withstand high pressures.

Induced Draught.—The "induced draught" trials of the Magnificent, says the Broad Arrow, have proved beyond question the superiority of the system to that of "forced draught." Induced draught is simply this: Fans are placed in the uptakes or funnels and draw the air through the furnaces, so that the more air that gets into the engine rooms and stokeholes, the better. There is no rushing of air, no unpleasant air pressure; whereas in the forced draught system everything is battened down and air is forced into the furnaces under pressure, generally with disastrous effects, such as fused fire bars and overheated furnaces. At no time during the four hours' trial did the temperature in the engine rooms or stokeholes rise above 78°, although it was an exceptionally hot day. Mr. Penn and the Admiralty officials, who were on board, were more than satisfied with the results. The engines worked without the slightest hitch from beginning to end, making 105 revolutions and working up to 1,200 horse power. The speed obtained was 17·63 knots, or 20·25 miles per hour. By the time the four hours' trial had finished the Magnificent had passed Hastings, having skirted the coast from the Nore, passing close to Ramsgate, Margate, Walmer, and Dover. The great test having concluded, Lord Charles Beresford, who was in command, and never left the bridge until he dropped anchor again at the Nore, tried the ship's turning powers with both engines full ahead, the circle being completed with a diameter of about 340 yards. He then stopped dead, and went full speed astern, reversed engines at full speed in opposite direction and did his utmost to find a weak spot; finally this splendid ship returned to her anchorage under natural draught, making 16 knots easily.

The Present Status of Walnut.—As a fancy wood, either for furniture or house finishing, says an exchange, walnut has yielded most of its prestige to oak, and the bulk of our American walnut wood now goes abroad, the greater portion of it being taken by Germany. At least 80 per cent of it is shipped to London, Liverpool, and Hamburg. There is no reason why it should have fallen into disfavor, but the fact remains that it is unfashionable in this country and it must go. The foreign shipments run along between three and a half and four and a half million feet, and the bulk of it comes from Kentucky, Tennessee, Ohio, Indiana, Texas, Arkansas, Missouri, Iowa, Illinois, and Pennsylvania. The finest shipments of the present year have been from Texas, but, as a rule, Indiana walnut is the best. Kentucky has more than any other State, but it does not average as high as Indiana. Walnut is graded into "firsts," "seconds," "rejects," and "culls," and the price varies from $18 to $20 for culls and $35 to $40 for rejects to $70 per thousand for firsts and seconds. The best grade of walnut is forest growth, what is known as "cornfield walnut." This is hard and irregular, with more or less windshakes. Walnut trees are worth from one dollar up, according to their accessibility, and there is no rule for finding them. A tree should be at least 16 inches in diameter, while some trees go up to over 50 inches; and a log over 60 feet in length is occasionally found. As a rule, however, walnut branches low, and short logs prevail. Figured walnut is a specialty and is used for veneering. Its price varies from six cents to a dollar a foot. One man in West Virginia is said to own a figured tree that cost him a thousand dollars, for which he asks four thousand, having refused three thousand. There are over six thousand feet in it. A walnut tree is at its best at about fifty years of age, or rather it should live that long before it is cut down for the market.

Our competitors in the European markets are Italy and Circassia, the latter furnishing "Black Sea" walnut. The so-called "French burls" that are shipped to this country to some extent are not French at all, but Circassian, shipped to Marseilles and reshipped from there. The Italian walnut is small and not of as good quality as the others.

As might be suspected, New York is the leading point of consumption in America, and the largest amount is shipped abroad from there, though some goes from Baltimore and Norfolk.

Carbide of Glucinium.—Glucina, as well known, has up to the present been placed among the oxides irreducible by carbon. Now the recent labors of Mr. Moissan have considerably diminished the number of such oxides and shown that, in many cases, the reduction can be effected with the aid of a sufficiently intense source of heat. In following the same order of ideas, Mr. P. Lebeau has undertaken some researches upon glucinium and its compounds. The pure glucina that he used was obtained from the emerald, which is its principal mineral. Then, by heating in the electric furnace a mixture of oxide of glucinium and carbon, he obtained, not the metal, but a definite carbide, pure and crystallized, the preparation and properties of which he recently made known to the Academy of Sciences.

His conclusions are as follows: (1) The properties of pure, crystallized carbide of glucinium, and, more particularly, the action of water, which decomposes it cold with the disengagement of methane, make it so closely resemble carbide of aluminum, C^3Al^4, that Mr. Lebeau has been led to attribute to it the formula C^3Gl^4. (2) Under such circumstances, the atomic weight of glucinium would be, say, 14, and glucina would become a sesquioxide with the formula Gl^2O^3.

The Vanderbilt Arboretum.

All those Americans who are interested in the material welfare of their country will watch with interest what Mr. George W. Vanderbilt is doing on his North Carolina estate. Mr. Vanderbilt, as is well known, is making on his estate a sort of model forest, where scientific forestry is to be practiced, and experiments made in acclimating valuable foreign trees, and in the most profitable management of the native species; but every one does not know that his plan includes horticulture and agriculture as well as forestry, and that he wishes and hopes to make his experience valuable to American farmers and land owners everywhere. With this view, he proposes to build on his property a little village, including not only a hotel, but houses and stores, where people interested in agriculture, who come properly introduced, may rent rooms or houses for themselves and their families, for such time as they may desire to study the work going on upon the estate. There can be no doubt that there will be plenty of applicants, for nowhere else in this country can such opportunities for advanced study of the sort be found. Fortunately for his countrymen, Mr. Vanderbilt is not only able, but willing, to expend large sums of money in experiments which may return, for the present, nothing but advances in scientific knowledge; and it is just these experiments which are perhaps, in the end, most valuable to the country.—Amer. Architect.

THOSE who hold that no man can avoid his fate may find support for their doctrine in the experience of Charles J. Weller, of Elkhart, Ind. He was employed in grinding at an emery wheel, but, regarding the position as dangerous, handed in his resignation. Five minutes before the time for ending his last day at the work the wheel burst and killed him.—Philadelphia Ledger.

Correspondence.

The Strangest Insect in the World.

To the Editor of the SCIENTIFIC AMERICAN:

With reference to the article on the above subject in No. 1, Vol. lxxiii, of the SCIENTIFIC AMERICAN, will you permit me in the interests of scientific pursuit to remark that up to the present the moth which produces the caterpillar attacked by the fungus Sphaeria Robertsii is not known to scientists, though it is surmised to be a member of the genus Hepialus or swift moths of Europe? It was formerly thought to be Hepialus virescens, the giant green moth of New Zealand, called by the Maoris pepe, but that cannot be, as virescens is a wood borer and undergoes all its transformations chiefly in the lower parts of the trunk of the New Zealand currant or wine berry tree, Aristotelia racemosa, and occasionally in other trees, such as manuka, leptospermum, the black maire, Olea apetela, etc.

The vegetable caterpillar, hotete (Maori), evidently pupates in the ground, and some must escape the attacks of the fungus spores to perpetuate the species, though the pupa has yet to be satisfactorily accounted for. From information obtained by my eldest son, G. H. Grapes, from the Maoris at Otaki, North Island, it appears that the grub or caterpillar pepeaweto (Maori) which begets this curiosity is dark olive green, about 3 inches long and found an inch or so beneath the surface of the soil, but, so far as I can ascertain, has never been seen by an entomologist. Specimens in my possession prove that the head is not the sole point of attack, but that both extremities are attacked indifferently; indeed, my experience tends to the belief that the anal extremity is the oftener selected by this singular and mysterious parasitical growth. The twig-like woody appendage is sometimes forked, and in one of my specimens exceeds 9 inches in length. The attacks of Robertsii seem altogether confined to the extremities of the caterpillar, unlike an allied British species, Isaria farinosa, which attacks the larvæ of the cabbage moth, Mamestra brassicæ, on the anal, dorsal, and abdominal regions indiscriminately. Parasitic fungi are met with in Australia and other countries which attack living and dead larvæ, pupæ, etc., consisting of upward of twenty-five recorded species, but none are so conspicuous or so remarkable, that I am aware of, as Sphaeria (formerly Torrubia) Robertsii, examples of which may be seen in many museums. Finally, I would observe that "Aweto" is the Maori appellation for the larva of the New Zealand convolvulus hawk moth, Sphinx convolvuli, frequently seen feeding on the kumara or sweet potato, Convolvulus chrysorrhizus.

GEORGE J. GRAPES.

Caerbroi Paraparaumu, North Island, New Zealand.

How to Make a Million.

A sprightly little sheet call Results, published in Chicago, devoted to advertising, gives an account of a meeting of prominent business men in St. Louis. It was, in fact, a meeting of commercial clubs of several cities, and among those present were a number of millionaires who were interviewed with the question, 'How can a man make a million dollars?" and these are some of the brief replies:

George M. Pullman: "Could not tell you—really, I could not. I did not come down here to be interviewed, and, anyway, this is too short notice to give a comprehensive opinion."

Marshall Field: "Oh, pshaw! What do you ask such a question for? There is no general recipe that I know of, unless it be industry, economy and a cheerful disposition."

P. D. Armour: "Oh, my gracious, what a question! I have lost my patent for making money, and now don't know any more about it than anybody else. Go ask Marshall Field. He is making lots of money now."

Lyman J. Gage: "I did not come here to talk about money making. It occurs to me that men who want to make money will know how and where to proceed."

Charles Fargo: "What do you ask me for? I've got no money. Pullman could tell you, if he would."

N. K. Fairbank: "I could not give you a rule, for there is no such thing in money making."

Marvin Hughitt: "Work like the devil, and hold on to what you make. A man must solve his own problem—nobody can do that for him."

Franklin MacVeagh: "Well, that is a poser. I will indorse all that Mr. Hughitt has said, however."

E. M. Phelps: "Go talk with those men who know—I don't."

Which all goes to show, adds Results, that the reporter went to the wrong people. He should have interviewed the "financial experts." It is clear that this reporter never did any interviewing for an advertising journal.

What does a millionaire know about making money, or a successful advertiser know about advertising?

The men who have really done anything never want to tell how they did it.

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BATTLESHIPS NOS. 5 AND 6.

On November 30, bids were opened at the Navy Department for the construction of two new battleships authorized by act of the last Congress, and prospectively, at least, our line of battle is thus augmented to six first-class ships of this type and of American design—the Texas, a second-class battleship, being from English plans.

In the Kearsarge, a namesake of the historic craft, and her sister ship, No. 6, as yet unnamed, we have the highest examples of their type. Their general dimensions and principal features are: Length on load water line, 368 feet; beam, extreme, 72 feet 2·5 inches; freeboard forward, 14 feet 3·0 inches; freeboard aft, 12 feet 3·0 inches; normal displacement, 11,500 tons; corresponding draught, 23 feet 6·0 inches; indicated horse power, estimated, 10,000; corresponding speed, 16 knots; coal supply on normal displacement, 410 tons; coal supply at 25 foot draught, 1,210 tons. Batteries: Main, four 13 inch breech loading rifles, four 8 inch breech loading rifles; secondary, fourteen 5 inch rapid fire breech loading rifles; auxiliary, twenty 6 pounder rapid firers, six 1 pounder rapid firers, four machine guns. The torpedo tubes, of which there are five, will be disposed one in the stem and two on each broadside amidships, and all will be of the above water type; the bow tube firing directly ahead and the broadside tubes discharging through an arc of fifty degrees toward the end of the ship nearest them.

The character of our coast and the generally shallow waters about many of our wealthiest seaports made a comparatively light draught an indispensable prerequisite in these new ships; in fact, the secretary insisted that they should draw less water than any other first-class battleship either here or abroad. The largest of European ships of this sort usually draw about 28 feet when fully laden, and our own Iowa and Indiana class draw something over 24 feet under normal conditions. The Kearsarge and No. 6, however, with all weights on board ready for sea and with 410 tons of coal in their bunkers, will draw but 23½ feet of water, and with 1,210 tons of coal dumped loosely into their bunkers, without packing or further handling, will have an even keel draught of 25 feet.

The general practice abroad of recent years, regarding the size of big guns, has been to restrict their heaviest armaments to calibers not exceeding 12 inches, apportioning the weight thus saved among more rapid fire guns or a wider or heavier distribution of armor protection. This matter was pretty thoroughly discussed anent the new ships, the Chief of Ordnance holding that the 13 inch gun would make our ships many degrees superior to our European neighbors, in fact, preponderously so; and, housed in two double-decked turrets, the four 13 inch and four 8 inch rifles would be more effective and better protected than could be the other guns in separate turrets of independent action, and this scheme was adopted.

The double-decked turret is essentially novel. Resting upon the protective deck, 3 feet 6 inches above the water line, the barbettes of 15 inch steel rise up to a height of three feet above the main deck, and within the protection of these heavy walls the turning, loading and other vital mechanisms of the guns and turrets are worked in comparative security. The turrets for the 13 inch guns will be as thick as their supporting barbettes, except where augmented two inches about the ports through which the guns peer out. The turrets for the 8 inch guns, rigidly fixed to the more ponderous one below and incapable of independent lateral movement, are 9 inches thick generally, except for a similar thickening of 2 inches about the face. The primary features of advantage possessed by this uncommon type of turret are the concentration of motive mechanisms and the unusual protection given the ammunition hoists for the 8 inch guns above.

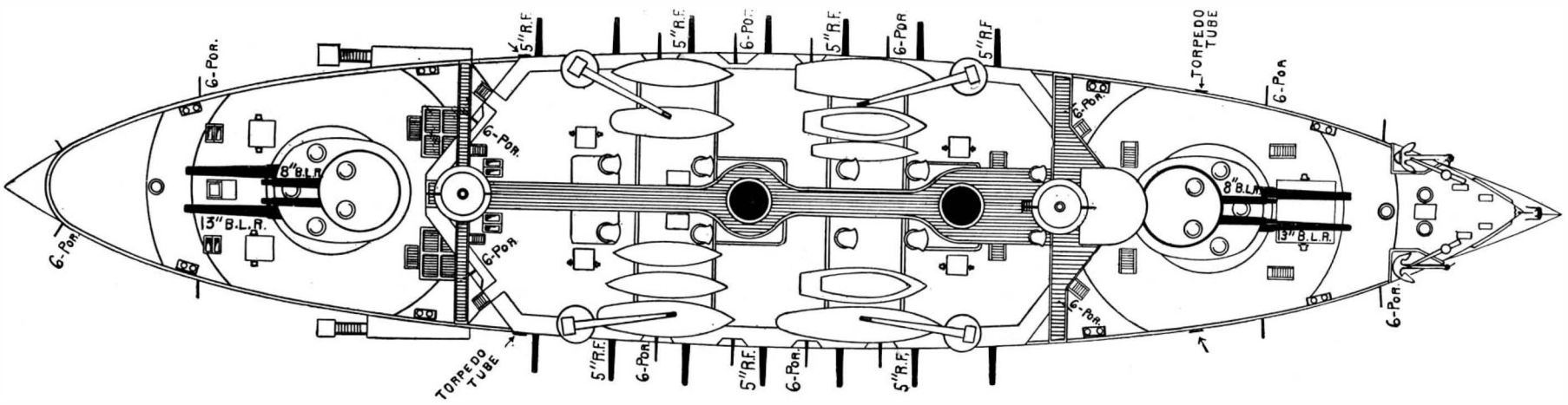
The guns in the turrets fire each through an arc of 270°, and in that have a pretty effectual sweep. In the broadside batteries of 5 inch rapid fire guns, seven on each side, firing through an arc of 90°, these vessels are unique, and may be said to bear directly the impress of lessons learned in the late Chino-Japanese conflicts, the 2 inch steel splinter bulkhead between each gun station and the side protection of 6 inches of solid steel armor being features of unusual safeguard for the rapid fire guns of any ships of this description. The battery above, of 6 pounder rapid fire guns, and the distribution of others of similar caliber on the berth deck forward and aft, give promise of very effective service against torpedo boat attack, while the 1 pounders and Gatlings in the tops will sweep the decks and other exposed positions of an enemy.

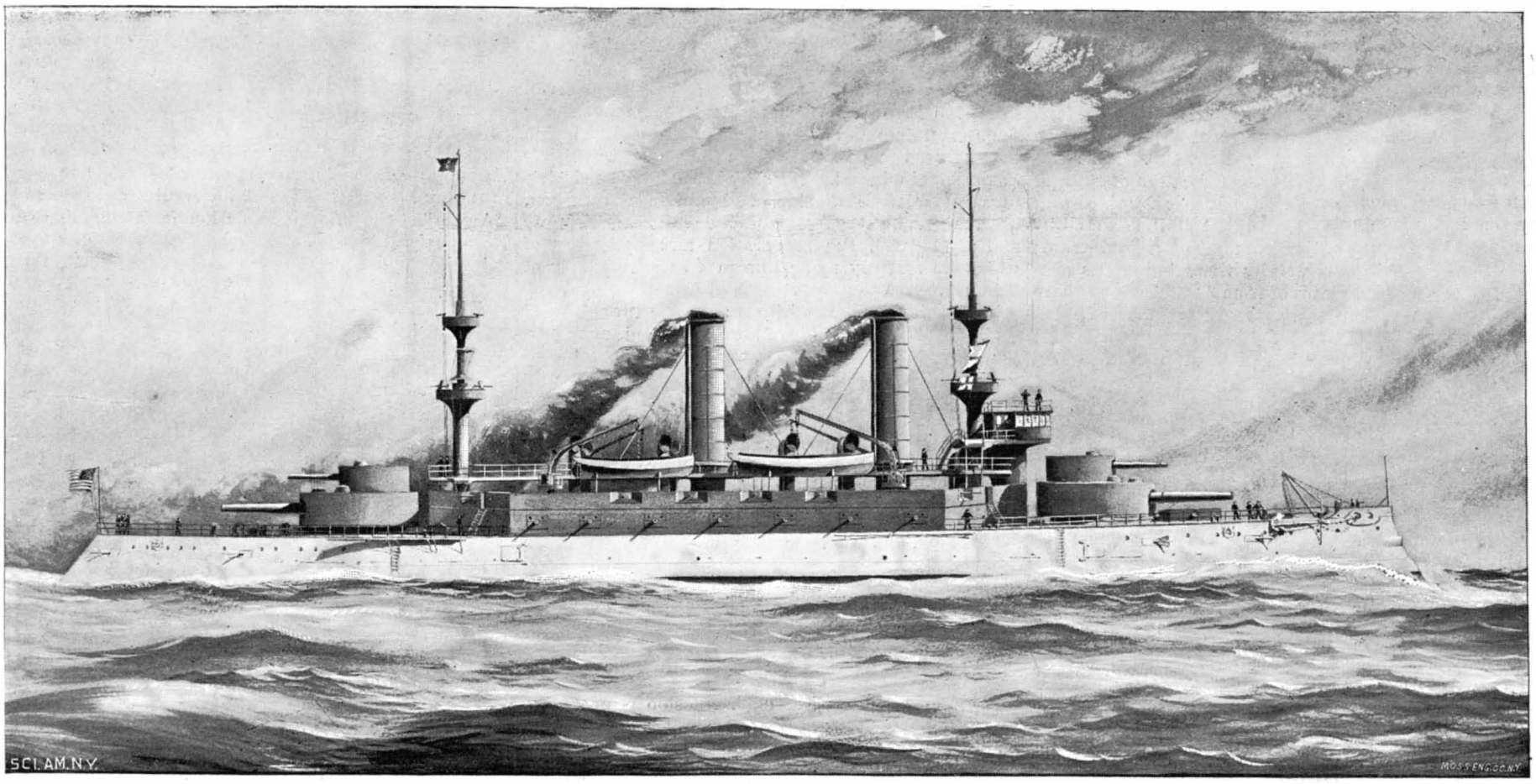
Offensively, the ships are extremely formidable, and defensively are exceptional in the thickness and distribution of armor protection about the guns and vital parts.

From the after barbette forward to the stem the water line region will be protected by a belt of armor 7½ feet wide, 4 feet of it being below water at normal draught. From the after barbette to the forward barbette this belt will have a maximum thickness of 16½ inches, tapering to 9½ inches at the edge below water, and from the forward barbette to the stem this armor will gradually diminish to 4 inches. At each end of the thickest part of this belt there will be an athwartship bulkhead, 10 inches thick forward and 12 inches thick aft, to oppose an enemy's raking fire. On top of the four walls thus formed will rest a flat steel protective deck 2¾ inches thick, completely roofing over and compassing the spaces occupied by the "vitals," as the engines, boilers, and magazines are called. Forward and aft of the boiler, engine and magazine spaces, this protective deck will slant to below the water line at the extremities, backing up the ram bow, and will be increased to 3 and 5 inches on the sloping sides of these parts of this armor deck.

A complete belt of corn pith cellulose will be worked fro n stem to stern, augmenting the protection of many feet of coal, and the 6 inches of armor extending from the top of the water-line belt up to the main deck and running in a fore and aft direction from barbette to barbette. A double bottom, reaching from the keel up to the lower edge of the armor belt, 4 feet below the water line, will protect the vessel from injury in grounding and minor damage from torpedoes.

Within this heavy steel box of Harveyized material, below the water and beneath many feet of coal, are the two sets of triple-expansion engines, one on each shaft, having cylinders of 33½ inch, 51 inch and 78 inch diameters, and a common stroke of 48 inches, which will drive the twin screws, while the five boil-





OUR NEW BATTLESHIPS NOS. 5 AND 6.

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ers—three double ended and two single ended—having a total grate surface of 685 square feet and a heating surface of half an acre—in four separate watertight compartments, will supply, at a working pressure 180 pounds, the steam needful to revolve the 16 foot propellers 120 times a minute when making the maximum contract speed of 16 knots an hour. Large fans will induce the needful forced draught, and pumps of thousands of gallons minute capacity will induce a circulation of water, feed the boilers, and clear the bilges.

Just under the pilot house there will be a conning tower ten inches thick, connected by a complex system of call bells, speaking tubes, mechanical telegraphs, and electrical telltales with every important center in the ship, bringing the captain, in action, in immediate touch with every department essential to complete control and knowledge of his ship's condition.

The least possible amount of wood will be used, light metal work being the general substitute, and where wood material is used and needful, it will be subjected to an electrical fireproofing process of established efficacy. Cork sheeting will cover the metal bulkheads in the staterooms and living spaces, to reduce the possibility of unhealthful condensation. The ships will be lighted by electricity, ventilated by natural and fan-induced ventilation, and pumped and drained in the most approved manner by steam and hand appliances; and every consideration has been studied to make the vessels comfortable and healthful nabitations for their flagship complements of 520 persons.

Compared with the old time craft, this complement seems inadequate; but hundreds of mechanical devices and numerous auxiliary engines have lessened the tax upon the muscular energies of the crew, and narrowed their duties to the simple direction of those conveniences which have made manifold the output of every man's efforts and given the vessels possibilities and facilities undreamed of twenty years ago.

With 1,210 tons of coal on board, at a cruising speed of 10 knots, the vessels will be able to cover 6,000 knots, and at a speed of 13 knots will be able to cross the Atlantic and then have coal enough left to travel a thousand knots farther. There will be no speed premiums. A penalty, however, of $100,000 a knot is imposed for failure to reach the contract speed of 16 knots. The cost of these vessels, exclusive of armor and armament, is limited to $4,000,000 each, and the time of construction specified as three years from the time of signing of contract.

Trial of a New Torpedo.

The new Howell torpedo, commonly called the "Baby Howell," was tried officially December 4, at Newport, R. I., before Commodore Sampson, Chief of the Bureau of Ordnance, and Lieuts. Roy C. Smith and Brown, of the Torpedo Board of the navy. Three shots were fired from the testing station of the Hotchkiss Gun Company in the Seaconnet River. For a range of 600 yards, about all the government cares for, an average of between 27 and 28 knots was made, the torpedo being submerged 4½ feet. It appeared to hold this depth throughout its entire run of about 1,100 yards.

Each time the torpedo came to the surface at about the same spot, and the time of the several runs did not vary 3½ seconds. This regularity was as pleasing to the officials as was the speed attained. The projectile, in more favorable weather, has made more than 29 knots, and the company say that they will show 32 for 600 yards, with their regular powder charge of 200 pounds.

ALL the copper tubes in the English torpedo boat destroyers of the reserve fleet at Portsmouth are to be taken out and galvanized steel tubes substituted. The copper fittings have broken down in a number of the boats that have been tested.

THE DE LA VERGNE MOTOR DRAG.

We have given illustrations of several of the horseless vehicles which took part in the Times-Herald motocycle race on November 28, and we now present an engraving of the De la Vergne Refrigerating Machine Company's motor drag, one of which also took part in the race. The De la Vergne machine won the fifth prize in the Paris-Bordeaux race of last June, so that it would undoubtedly have made an excellent showing in the Thanksgiving Day contest, if the rubber tires had not slipped, so that the race was abandoned at Sixteenth Street, Chicago. The horseless carriages of the De la Vergne Company are of two kinds, the hunting traps which are built to accommodate four people and the drags which accommodate six people. These carriages are not on the market at present.

The drag which we illustrate weighs about 1,800 pounds and has three seats. The frame is of iron. Around this the carriage maker has constructed the vehicle. In the drags two gasoline motors, of four horse power each, are used, each motor being distinct. The engines weigh about 375 pounds each. The two cylinders are balanced so that the vibration is noticeable only when standing still. The tank for gasoline is under the front seat, and the carbureter, which is used to prepare the gas, is in the extreme rear of the vehicle. The gasoline tank holds enough for a three days' run. The motor is a modification of the well known Benz motor. The explosion is produced by a spark, the battery being also in the front of the vehicle. The cylinders are cooled by means of water jackets connected with a tank having a capacity of 250 pounds of water, which is sufficient for a run of six hours.

The noise of the exhaust is stifled by a muffler, in which is also placed a condenser, which condenses the unburned gas and products of combustion which are expelled at the bottom of the vehicle, thus preventing disagreeable odors. The power from the motors is transmitted to the driving wheels through the medium of belts and chains and sprocket wheels. The power is transmitted to the rear wheels by means of chains and sprocket wheels. Part of the spokes are secured directly to the large sprocket wheels, thus giving great strength. In the smaller vehicle the motocycle is stopped and started by shifting of the belts, which run to a countershaft. In the larger motocycles a friction clutch is used, which also controls the speed. The motor can be stopped, if necessary, by simply turning a lever, and the wagon can be reversed without stopping the engine. The limit of speed is said to be from 3 to 25 miles an hour. A powerful brake of the ordinary kind is provided. The steering wheels are pivoted at the hub, the ordinary fifth wheel is also used; the steering rod runs up to the seat. Equalizing springs serve to hold the steering connections in place and keep the lever steady. The wheels are respectively 36 and 48 inches in diameter, and are fitted with solid rubber tires of the Rubber Tire Wheel Company.

In the improved machine the lamps will be lighted by electricity, which is generated by the motor. James F. Bate, the umpire on the De la Vergne Refrigerating Machine Company's gasoline motor wagon on the day of the race, made the following report:

"Half a gallon of gasoline was used in the trip of the De la Vergne wagon from the starting point to the testing room, at 1557 Wabash Avenue. The start was made at 8:56 o'clock, but the wagon had not gone far before the wheels began to stick in the snow. The stretch from the starting point to Fifty-fifth Street and Michigan Boulevard was especially rough, and several times the Benz motor was unable to drive the wheels forward. The rubber tires slipped in the snow, and before Cottage Grove Avenue was reached Frederick C. Haas, who was operating the machine, decided not to attempt the race. Then the wagon was pushed over the bad stretch of snow-laden road. When the motocycle reached Michigan Avenue, it went along smoothly, but not at a great rate of speed. At sixteenth Street Mr. Haas turned the vehicle from the course and stored it at the testing room. The run was made in one hour and a half."

The De la Vergne Company, of New York City, in addition to making their large refrigerating plants, are now also making the Hornsby-Akroyd oil engine. They regard their motor carriages as experimental at present.

THE DE LA VERGNE MOTOR DRAG.

Destruction of Forests in California.

In the University of California Magazine Mr. Charles H. Shinn, in writing of the lavish way in which the best parts of the California forests have been cleared away, states that in the Comstock mines alone enough timber has been used to build all the houses needed for a city of 50,000 inhabitants. He has seen the bottom of a cañon crowded for miles with the trunks of pines from each one of which a few flume blocks or a log of butt timber had been cut, while the rest was left to decay. Not to mention the thousands of acres of the most magnificent coniferous timber known to man destroyed by fires which have burned out the soil itself into great pits, it is stated that the waste of timber in the redwood districts has been even more appalling than it has been in the Sierras. More than once the world's record for the number of feet cut in a day has been broken by some one of the sawmills of the coast redwoods. So much lumber is still produced by rival mill men that it has not paid for cutting, and some of the large California firms of lumbermen have become bankrupt. Enormous trees that represent from 800 to 1,000 years of symmetrical growth have been sawed up with no profit, or with actual loss, when, if they had been left to stand a few decades longer, the profit might have been a thousand dollars an acre.

At the time of the American occupation of California the forests covered, perhaps, 50,000 square miles. Half of this has been cut over or is inaccessible or consists of species of less value than those which have heretofore been cut. It is often asserted that California still has twenty millions of magnificent forest land, but the truth is that there is left hardly fifteen million acres, and much of this has been cut away.

Gelatin—Its Saline Digestion.

Gelatin is transformable into a kindred substance, gelatose or protogelatose, characterized by want of the property of forming a jelly and of being precipitated by a standard solution of sodium chloride. In cultures of liquefactive microbia it is observed in the first moments that the gelatin is changed into gelatose. Gelatin loses the property of jellifying if left in contact with an alkaline chloride or iodide. With the fluorides, the transformation is only partial. The change may be named saline digestion.—A. Dastre and N. Floresco.

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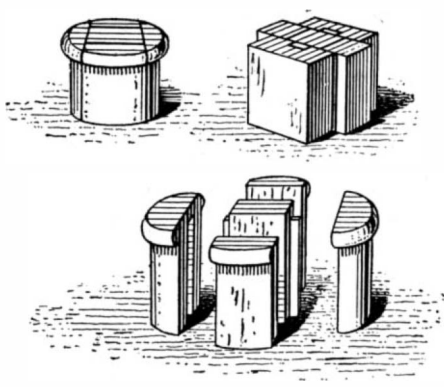
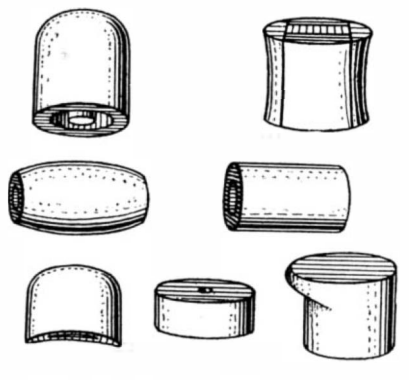
MANUFACTURE OF HAT BLOCKS.

A great number of the hats that are manufactured, such as golf, derby, yachting, silk hats, etc., are shaped over wooden blocks made from the whitewood tree. The trees grow principally in the Southern and Western States, and are straight grained, porous, and free of knots. The stock, which costs about $60 per thousand feet, comes to the manufacturer in logs, measuring about 12 to 16 feet in length and from 7 to 8 inches in width and thickness. The material before being worked requires from six to twelve months' drying, the logs being cut up into short lengths and piled one on another in a room for that purpose and dried with steam heat. The blocks over which the yacht and golf hats are formed are made up into five parts, the pieces of wood being first sawed into the proper size, then planed, grooved, and glued. Two of the side pieces of these blocks are grooved out in the center, the groove being about one half of an inch in depth, about one inch in width, and about six inches in length. Glued to two of the sides of the center parts of the blocks are two tongues or strips of wood, which are made so as to fit perfectly when the blocks are put together in the grooves of the side pieces. After the pieces have been grooved and tongued a strip of paper, the width and length of each block, is glued between them, which holds the pieces together, so that after it has been ovaled and finished it can be easily broken apart. The grooving is performed by the operator pushing the blocks, which are fastened to a sliding table of the machine, over a revolving knife traveling at the rate of about 3,500 revolutions per minute.



A FIVE PART BLOCK

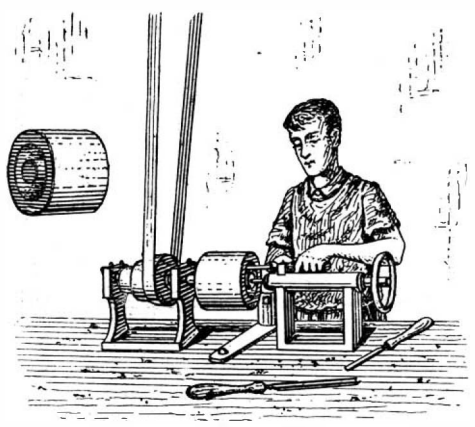


HAT AND MUFF BLOCKS.

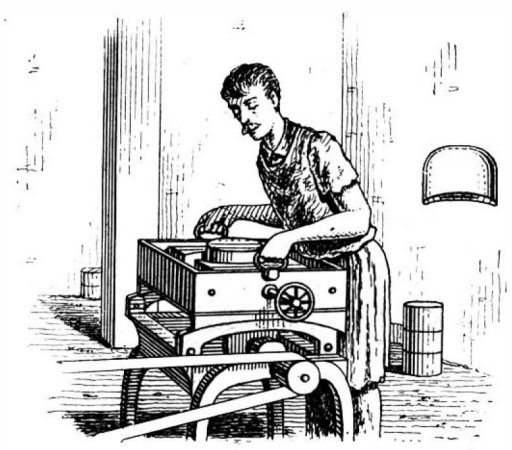
The corners of each block are first sawed off before being ovaled. The block and pattern are both securely ironed to a revolving shaft which is connected to a movable frame attached to the machine. The back and forward movement of the frame is caused by the revolving oval-shaped pattern bearing against a revolving wheel. The block to be ovaled, which travels at the same rate of speed as the pattern, comes in contact with another wheel, connected to which are four hook-shaped knives about 1¼ inches in width. The knives are bolted to the wheel at an equal distance apart and travel at the rate of about 4,000 revolutions per minute. The knives make an upward cut, moving and cutting along the block until finished, the operation taking about three minutes. The pattern and block travel at the rate of about 200 revolutions per minute.

After the ovaling operation has been performed, an inch hole is bored into the center of the block, about two inches in depth, so that a peg can be placed in it to hold the block during the next operation. The peg at one end is square, and is fastened securely in a wooden vise. The operator then places the block on the circular end of the peg and goes over the entire surface with a number of spokeshaves, trimming off the roughness. The block is then sandpapered by placing it on the end of a circular wooden peg, similar in shape to the other, which is connected to the end of the shaft of the machine. The machine, when in motion, travels at the rate of about 3,500 revolutions per minute, the operator holding a fine sheet of sandpaper on the revolving block, which smooths off the surface in about one minute. For derby and silk hats the bottoms of the blocks have to be curved.

This is performed by fastening the blocks in a movable frame which the operator pushes over two revolving 10 inch knives, connected lengthwise to the shaft of the machine. The frame, containing the block, rests on two curved iron runners; over these the attendant pushes the frame. The knives which come in contact with the bottom of the block cut out the proper curve as the frame passes over the runners. The knives travel at the rate of about 4,000 revolutions per minute, the curving operation taking about one-half minute. In cutting out hand holes the block is fastened in a lathe, the operator, by means of gouges, scoring out the holes as the block revolves. The hole is scored about from 4 to 6 inches in diameter, according to the size of the block, and about 2 inches in depth, a solid portion for the hand to grasp being left in the center about from 2 to 3 inches in diameter. The blocks, when finished, are given a coating of raw linseed oil and paraffine. The finished blocks range in height from about 4 to 10 inches, their diameters being from 4¾ × 5⅜ inches to about 6⅜ × 7½ inches. About 60 blocks daily can be turned out with the labor of about 5 men. The sketches were taken from the plant of Henry A. Ashwell, New York.



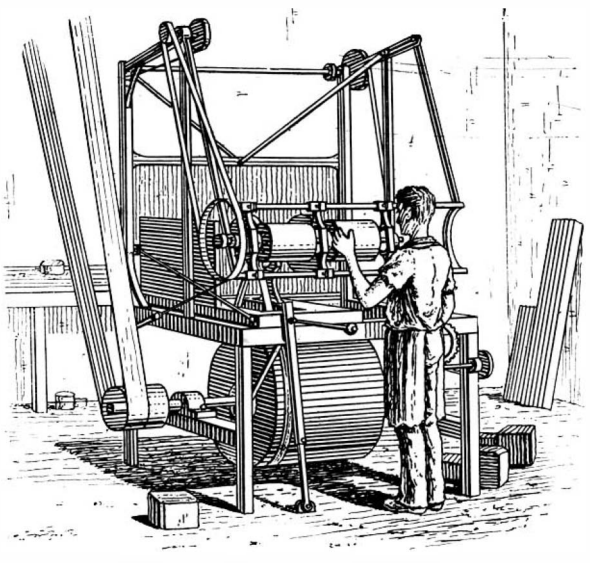
CARVING HAND HOLES.



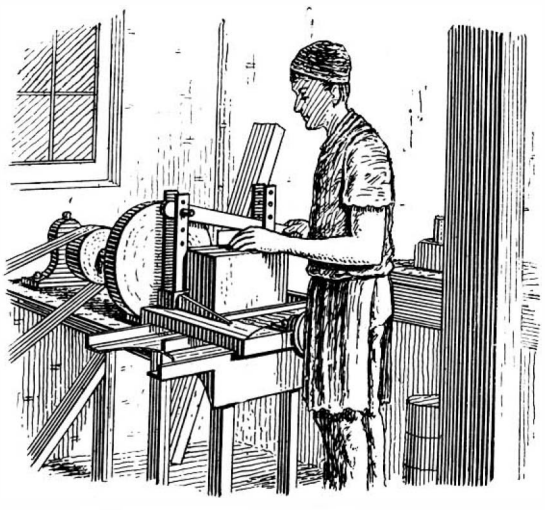
CURVING BLOCKS

SANDPAPERING

SHAVING BLOCKS.



OVALING MACHINE



TRIMMING BLOCKS

Gas Engines.

In Germany the first application of gas motors to raising water was made at Duren, near Aachen, in 1884; and in the same year a steam engine was replaced by a gas motor for the same purpose at Quedlinburg. In 1886 Rattwill and Coblenz, in 1887 Furth and Peine, and in 1888 Karlsruhe and Munster followed suit; and these installations are still working with excellent results. According to a recent report of the Quedlinburg Gas and Water Company, the saving in the cost of pumping with gas engines, as compared with steam, taking the last year in which steam was used and the second with gas, was 42 per cent. While the gas motor occupies less space than the steam engine with its boiler and chimney, it has the advantage as regards attendance, for one man can look after several gas engines, while a steam engine plant of any importance requires an engineman and stoker, and often an additional hand to keep up the coal supply. Another advantage of the gas motor is the fact that it can at any time be put to work immediately, so that considerable water pressure may be made available in a few minutes, which is very important in case of fire, while the dimensions of reservoirs may be reduced if the motors be kept constantly running.

By Rail from New York to San Francisco.

The exact distance and time between New York and San Francisco are not very easy to remember, especially for persons like railroad men, who haven't the time, and editors, who haven't the money, to make the trip very often; and it is, therefore, worth noting that since the establishment of the last fast train by the Union Pacific the time is almost exactly 100 hours. This is the apparent time. By Eastern time the train arrives at San Francisco at 11:45 P. M., making the actual time consumed on the road 103¼ hours, the apparent time being 100 hours 15 minutes. The distance is 3,332 miles (New York Central, New York to Buffalo, 440; Michigan Central, Buffalo to Chicago, 535; Chicago & Northwestern, Chicago to Council Bluffs, 490; Union Pacific, Council Bluffs to Ogden, 1,034; Southern Pacific, Ogden to San Francisco, 833). The connecting train east of Chicago is the North Shore Limited, leaving New York at 4:30 P. M., and arriving in Chicago at 4:30 P. M. the next day. The rate of speed, through, is 33·27 miles an hour, which includes the 1½ hours' delay in Chicago. The rate of speed from Chicago is 30·7 miles an hour.—Railroad Gazette.

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THE BLACKSMITH AND HIS FORGE.

There is now on exhibition in this city a remarkable painting, "The Blacksmith" (Le Forgeron), by the late Hubert E. Delorme, who died in Paris in 1894. Mr. Delorme was born at Givors, in the Rhone district, France, in 1842. From early life he had the artistic impulse. He went to Paris while still a young man, and through his innate industry and skill soon made himself a place in the world of art. He exhibited at both salons. His works are remarkably realistic. "The Blacksmith," the painting which we reproduce in half tone, is the most notable of his works. It embodies two features, involving very delicate handling and a fine appreciation of the different qualities of light. The sturdy smith stands gazing at the iron in the fire, which is nearing the proper heat. The ruddy glow of the forced fire is seen and the radiated heat is felt by the spectator as it is realized that both the heat and the light are received in full force on the face, neck, and arms of the blacksmith, who patiently waits, tongs in hand, for the iron to heat. The sparks and the color of the fire show that the fuel used is charcoal. Smoke circles around the forge, and dust, cobwebs, cinders, scraps, and tools are in their natural places.

An open door and a dusty window on the left let in bursts of sunlight, while another window—not seen—admits diffused daylight. Here, then, are three kinds of light flooding the shop and illuminating the figure, but still the light is all in perfect harmony. The different lights do not nullify each other, as one might suppose they would, but rather enhance the effect so as to bring out the figure of the blacksmith with wonderful relief against the remote depths of the shop. The flesh and muscles of the man have a texture belonging to a blacksmith. It requires no effort to feel that there is life in the picture. None of the details are slighted; the anvil and the hammer have an appearance which comes from continual use. The scale and cinders upon and around the anvil block show that the day's work is already partly done, and yet nothing in the picture has the appearance of having been overwrought.

Our engraving is a very successful reproduction in half tone of a most difficult subject, and is as faithful as anything in black and white can be. Orthochromatic plates were used and a yellow screen was interposed in the light beam between the lens and plate. The lens employed was a fine Zeis anastigmat, and impressions were made both by daylight and artificial light.

The difficulties in the way of securing correct color values will be appreciated when it is known that the light of the forge fire is orange, with a tendency to red, while the daylight illumination has the true bluish cast characteristic of strong actinic light. A photograph taken with an ordinary plate, and without a yellow screen, shows the fire dark, and the firelight is shown as a shadow rather than illumination; but with orthochromatic plates and the yellow light sifting screen everything was perfectly rendered excepting a slightly exaggerated illumination on the sunlit portions and the surfaces illuminated by diffused daylight alone. This slight defect was corrected by flowing on the back of the negative a thin coat of orange lacquer and, after it became dry, removing with alcohol portions opposite the places lit by daylight, thus screening the main part of the negative while the sunlit portions were allowed an increased exposure.

Much difficulty was experienced in securing an angle of illumination which would prevent the reflection of light from the ridges of the brush marks. This was especially true in the case of artificial illumination, in which also uniformity of illumination proved a problem. To avoid the first difficulty, the light was allowed to strike the canvas at a low angle, so as to cause the stray light to be reflected away from the field of the lens, so as not to affect the plate. Uniformity of illumination was secured by burning the magnesium torch on either side of the camera as near the canvas as possible without bringing it into the field of view.

The best results, however, were secured by daylight. An exposure of thirty minutes was required to bring out all the detail. This necessitated the use of a restrainer in developing.

THE BLACKSMITH AND HIS FORGE.

Gold and Silver.

The Director of the Mint has submitted his report to the Secretary of the Treasury, covering the operations of the mints and assay offices of the United States during the last fiscal year.

The value of gold and silver estimated to have been used in the industrial arts during the calendar year 1894 was approximately $21,541,652, of which $10,658,604 was gold and $10,883 048 was silver.

The estimated metallic stock in the United States on July 1, 1895, was: Gold, $636,229,825; silver, $625,853,949, a total of $1,262,083,774. The estimated product of gold and silver in the United States during the calendar year 1894 was: Gold, 1,910,813 fine ounces, of the value of $39,500,000; silver, 49,500.000 fine ounces, of the commercial value of $31,422,000 and of the coining value of $64,000,000.

The estimated production of the world for the calendar year was: Gold, 8,737,888 fine ounces, of the value of $180.626,100; silver, 167,732.565 fine ounces, of the coining value of $216,892,200, of the commercial value of $106,522,900.

Mr. Preston gives an estimate of the approximate stock of money in the principal countries of the world. He places the gold stock at $4,086,800,000; the stock of full legal tender silver at $3,439,300,000, stock of limited tender silver at $631,200,000, making a total silver stock in the world of $4,070,500,000; the uncovered notes are placed at $2,469,500,000.

An Important Patent Decision.

By a decision filed Dec. 2, in the United States Circuit Court of Appeals, third circuit, a previous decision of the New Jersey Circuit Court was reversed, and patents 291,784 and 291,785 of Augustus Schultz, of Brooklyn, N. Y., were sustained. These patents are for a method of tannage of light leathers, styled the chrome tannage, which has become of great importance in the leather trade within the past five years. In glazed kid for ladies' shoes, which formerly constituted a considerable item in our imports, the home production of chrome tannage almost entirely supersedes goods made in the old way, the imports now being very small, and our kid finishers having already obtained considerable export trade. In the production of colored calf and morocco leather this process has also met with success, the chrome tanned leathers being of greater toughness and affording better resistance to moisture, and thus having increased wearing capacity.

Nearly one thousand printed pages of testimony were taken on both sides of the case, and it was argued before the Circuit Court at Trenton, N. J., in the spring of 1894. The principal defense raised in the suit was the alleged insufficiency of Mr. Schultz's specifications, and certain prior patents and publications, which were said to describe the same invention. After holding the case under consideration for nearly a year, Judge Green handed down a decision in favor of the defendant, holding that the Schultz patents were anticipated, and therefore invalid. An appeal to the Circuit Court of Appeals was at once taken, and the appeal was argued before Judges Acheson, Dallas, and Butler, in Philadelphia, last September. The points discussed in the appeal were similar to those in the Circuit Court. On the 2d inst. the Circuit Court of Appeals handed down its decision, which was written by Judge Dallas for the court, reversing Judge Green's decision and deciding in favor of the patents, both as to the alleged insufficiency of specifications and as to anticipation by prior published processes. The claim that the decision is unappealable and irreversible is based on the statute which invests in the Circuit Court of Appeals the final jurisdiction in patent cases.

Thousands of dollars have, according to the Shoe and Leather Reporter, been spent in this litigation. Expert testimony has been given by such conspicuous scientists as Dr. C. F. Chandler, of Columbia College, New York; Prof. Samuel P. Sadtler, of the University of Pennsylvania; Arthur D. Little, chemist, Boston; Dr. Henry Morton, of Stevens Institute, Hoboken.

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Bleaching Cotton Piece Goods.

Cotton piece goods are bleached in different ways, according to the use to which they are to be put. The operation is generally performed in such a way that the singed and washed piece is first passed through a lime bath of 5 lb. of lime to 100 lb. of goods. The material is next washed, acidulated with hydrochloric acid, ¾ to 1½° B., then boiled—4 lb. soda, 2 lb. resin, and 1 lb. caustic soda being used per 100 lb. of goods; washed again, and treated in a chloride of lime bath of 1½ to 2 lb. chloride of lime per 100 lb. of material; acidulated with hydrochloric acid, 1½° B.; again washed, and then dried. Attempts have often been made to combine the processes of chloring and acidulating, but without satisfactory results, the pieces so bleached having a yellow tinge after washing. In many bleaching establishments the liming process and the boiling are united, the cotton pieces being boiled in a lime and soda solution.

In large cloth printing houses the cotton pieces are singed first, then washed, limed, acidulated, washed again, and afterward boiled out twice with soda, caustic soda, and resin. The quantity of ingredients to be used for the boiling operation depends on whether the cloth is to be treated in the open or closed vat, under pressure, and, if the latter, the quantity of caustic soda is decreased. After boiling from 6 to 12 hours, the pieces are washed in the washing machine, then entered into the chloride of lime bath, next taken out and entered direct into the acid bath, in which they remain for a short time, after which they are washed again and dried. All these operations are performed by the continuous process—that is to say, the pieces are stitched together at the ends and are passed in rope form through the different baths in succession. To remove any remaining chlorine, the washed pieces are passed through a cold solution of bisulphite of soda, and again washed. In the continuous process, care must be taken to pass the washed cloth through a vessel containing diluted spirits of hartshorn, in order to remove every trace of free acid. To bleach 100 lb. cotton cloth, a lye consisting of 10 lb. lime and 10 lb. calcined soda is prepared, allowed to settle, and the clear fluid is poured into the boiling-out vat. The cloth is then entered into the suitably diluted lye, and boiled from 6 to 8 hours, after which the liquor is allowed to run off, and the cloth is cooled with cold water. Next, the goods are thoroughly acidulated with hydrochloric acid, ½ to 1° B., and washed in the washing machine. For 100 lb. cloth, the chlorine liquid is prepared from 1¼ to 2 lb. chloride of lime, rubbed in water, in a perforated drum, into a fine milk, then strained, and the cleared liquid is used for bleaching. The chloride of lime bath is started with cold water, the prepared cloth being immersed in it from 6 to 8 hours, after which it is taken out and acidulated in a cold bath with hydrochloric acid of 1° B.; then washed and dried.

The addition of a little petroleum naphtha to the boiling-out bath has been recommended, in order to increase the cleansing effect, which process has proved quite efficient; in this case, however, the boiling water must not contain lime, but only caustic soda, resin, and soda. If this mode of cleansing is adopted, the cotton cloth is first treated in the lime bath, then acidulated and washed, and afterward entered into the boiling-out bath.

It is necessary in bleaching cotton cloth to distinguish between the so-called market bleach and the printing bleach. The first does not require the addition of resin soap, although when it is used the white obtained is always clearer and brighter, but the second bleach does. It is well known that print cloth bleached without resin soap or not sufficiently boiled out prints badly and that a clear white on it is impossible, but the co-operation of the dissolving resin is indispensable for the print bleach, because, besides the natural impurities of the cotton that remain in the cloth, there are those resulting from the weaving, etc., which are removed by the resin soap.

Experiments for bleaching cotton cloth with peroxide of hydrogen have been quite successful, but it has been found that this method is too expensive. It has, therefore, not been generally employed, except for very fine cotton cloths, the price of which can include a suitable charge for bleaching.

The electrolytical bleaching methods have lately been regarded more favorably; the Hermite mode, the oldest, has had to stand many attacks, and it is still doubted whether it can be used on a large scale. The more recent methods by electrolysis are all based upon decomposing a solution by electrolysis and bleaching the cloth with it, but it is not yet known what would be the result in actual practice, as such a plant requires the outlay of much capital. The latest bleach method—Siemens—i. e., by the use of ozone, is still too much a matter of experiment only to be able to express an opinion here, the views regarding its practicability differing most widely. It is stated, however, that by the use of the Siemens apparatus, it is possible to generate 20 grammes ozone per horse power per hour. This is a very small quantity, but when one considers what an immense effect can be produced by it, one is almost forced to conclude that, in the near future, the bleaching of cotton cloth with ozone will be attempted in the cotton goods industry.—Farber Zeitung.

The Maximum Depth of the Ocean.

A sounding has recently been taken in the Pacific Ocean, near the coast of Japan, which showed a depth of 29,400 feet, or approximately 5½ miles. This is a little more than the height of the loftiest mountain, Mount Everest, which is situated in the Himalaya range, to the north of India.

How much deeper the Pacific is than this it is impossible to tell; the wire having broken, presumably through its inability to sustain its own weight. In a previous attempt to reach the floor of the ocean at this spot, the wire broke at a depth of 25,800 feet. It has been suggested, as one theory of the formation of mountain ranges, that they represent the crumpling up, or buckling, of the earth's crust under the severe contraction strains that were set up as the surface of the globe solidified.

If this be true, the deep ocean valleys or gorges, such as this off the coast of Japan, must be the result of the same action. Taken in connection with the loftiest mountain, this sounding gives a difference in distance from the earth's center of about twelve miles, or $\frac{1}{888}$ of the earth's radius.

The Thermophone.

This is an electrical apparatus in which sounds are produced by the changes in the circuit due to variations of temperature. Its use is to measure temperature, particularly the temperature in a distant or inaccessible place; at the bottom of a pond, for instance. For obtaining deep sea temperatures it is useful, and it may also prove of great service in the ventilation of buildings, for by this instrument the temperature of any room in a building can be registered on a dial placed in the hall. The scientific uses of the thermophone are obvious, and it will be of great aid to physicists in determining the fluctuations in the temperature of the soil and the difference in temperature between the water at the surface and that at the bottom of ponds or lakes.

RECENTLY PATENTED INVENTIONS.

Engineering.

FURNACE.—Milton T. J. Ochs, Allentown, Pa. This is a furnace especially designed to utilize as fuel tan bark, mill refuse, and similar material. A series of transverse arches is arranged in step-like order above the grate, their adjacent edges overlapping and spaced apart to form latetal openings for the products of combustion to pass between the arches, there being in the furnace walls flues whose lower ends open into the ashpit below the grate while their upper ends open into the fire box below the arches.

Railway Appliances.

CAR COUPLING.—Robert T. Dressler, Buchanan, Mich., and Velimir Timitch, Hastings, Neb. According to this improvement the coupler has its drawhead pivotally connected with the draw bar for a horizontal oscillatory movement, and the draw bar is pivotally connected to the car frame and held in engagement with adjusting and locking devices whereby the bar may be adjusted vertically. The coupling is automatically effected when the drawheads come together, the uncoupling being effected from the top or sides of the car, and the coupling members being positively held from jumping up when they engage.

FARE BOX.—Le Roy C. Godwin, Portsmouth, Va. This is a box adapted to be supported from the body of the conductor by a shoulder strap for the reception of fares, the coin after having been placed in the box being still visible. There is also a purse or storage chamber for the final reception of the coin, provided with a suitable locking device. The throat or inlet of the box is so made that a coin may be readily passed in, but cannot afterward be fished out.

Miscellaneous.

BICYCLE DRIVING GEAR.—Dan Gregory Bolton, Cooperstown, N. Y. This is a changeable gear, light, strong and simple, for driving a wheel with more power and slower speed up a hill or on rough road, or at a greater speed on a level. The change from one gearing to the other is readily made by means of a hand lever, without inconvenience to the rider, and the construction is designed to combine the maximum of strength with the minimum of weight.

BICYCLE BELL.—I. N. Hopkins, Lockport, N. Y. This improvement combines a bicycle handle and alarm bell, which can be readily placed on the handle bar instead of one of the ordinary handles, and be operated by the thumb of one hand. The handle is tubular, and at its outer end is a metallic ring integral with a yoke which supports the bell, whose rim is near but not in contact with the end of the handle, the external form of the bell conforming to the curvature of the handle, and forming a properly rounding finish for the handle end.

WALL TELLURIAN.—Grant B. Nichols, Wapakoneta, Ohio. This is an apparatus adapted to be folded against a schoolroom wall, to take up but little space, and comprising an inclined table with apertures arranged in an ellipse to represent the path of the earth, a second series of apertures representing the path of the moon with respect to the earth, a rod in a central aperture carrying a ball representing the sun, while ball-carrying rods represent the earth and moon, these rods to be at any time inserted on the proper date in their respective apertures, to show the relative positions of the sun, earth, and moon. The invention also comprises other valuable features designed to facilitate the work of teachers.

INDEX CUTTER.—Frederick C. Mehnert, Goshen, Ind. For cutting the index sheets or leaves of books this inventor has devised an apparatus to be easily operated by an inexperienced person, doing the work with great precision and rapidity. The book whose leaves are to be cut is placed on an adjustable platform, when the leaves are laid on a die and beneath a presser foot, and, by stepping on a treadle, a cutter head is moved down to cut the leaves. The platform may be automatically fed lengthwise to bring successive leaves in position to be cut.

COPYING BOOK.—Edwin Fowler, Kansas City, Mo. This is a letter press book having a series of sheets forming surfaces receptive of copying ink for press copying, the sheets bearing consecutive numbers or letters in copying ink, which numbers are transferred to letters copied. By this means copied letters may be conveniently designated and found in the copying book.

HYDROCARBON BURNER.—Jacob W. Rees, Cleveland, Ohio. This burner is adapted to burn either oil or gas, producing the gas from oil, and is provided with an asbestos-lined drip pan adapted to be set in the fire box of an ordinary cook stove, burners being supported on standards above the drip pan to bring the flame to the proper position. Oil burned on the drip pan generates gas in a generator supported above the pan when the apparatus is employed as a generator and burner.

TYPEWRITER ATTACHMENT.—William S. Bigelow, Boston, Mass. This invention provides a simple device by which the key when depressed will be held down, as when upper case or figure printing is to be done, the key being released by a natural and easy movement of the hand and finger, when such printing is finished, to throw the machine into normal position. An independent spring catch is adapted to engage and project above the key to hold it depressed, the key being released by a wiping or drawing movement of the operator's finger.

PHOTOGRAPHIC SHUTTER RELEASER.—Arthur M. Boos, Boston, Mass. To automatically release the shutter, in time or instantaneous work, enabling the photographer to be away from the camera while the exposure is made, this inventor has provided a device for pressing the shutter-releasing button, the device being normally held out of contact by a fuse string, the time of burning of which regulates the duration of the exposure.

MUSICAL INSTRUMENT.—Lewis E. Pyle, Elam, Pa. This invention relates to mandolins, guitars, etc., and provides an instrument designed to be rich in melodious tones, while it is arranged to prevent bending of the neck, and formed to fit properly on the body to facilitate executing the music. The body of the instrument is approximately heart-shaped, and the tailpiece is located in the recess at the base of the instrument, being thus protected from contact with any surface on which the instrument may be placed.

FISH POND.—Charles Braaf, New York City. This is primarily an apparatus to afford amusement, comprising a pond or aquarium inwhich artificial fish may be placed and kept constantly moving to represent life, the water being also in motion. The construction is such that a single attendant may wait on visitors, and a stand is also provided for the display of prizes, each fish being numbered and the prizes being for successful fishers.

BEDSTEAD.—Andrew Stratton, Augusta, Wis. This is an improvement in bedsteads which have legs that fold and provided with casters for easy movement. A supplemental frame is arranged to telescope on the bed frame, and prop legs pivoted on one frame have their ends arranged to engage the other frame, there being means to hold the prop legs in adjusted position. The bedstead, when not in use, may be made to take up but little floor space.

BATH TUB.—Elizabeth G. Smith, New York City. This invention provides a tub which may be readily moved from place to place and conveniently set up, the tub having a collapsible frame, the bottom and auxiliary sides of which are formed of a sheet of waterproof material, the sheet having stiffened edges adapted to pouring water therefrom, while removable fastening devices hold the sheet in engagement with the upper edges of the frame.

STOVE.—Mark W. Foster, Pecatonica, Ill. In heating stoves which have a horizontal damper or diaphragm dividing its interior into two compartments, this invention provides an improved construction, there being a slidable horizontal damper in the combustion chamber with a central opening directly beneath the pot hole, there being an independently slidable plate for closing the opening. Special means are also provided for suspending and rocking the grate.

VEHICLE RUNNING GEAR.—James Duncan, Adelaide, South Australia. This invention provides for the employment of a special spring bed extended so as to also form a draught bar, at the two ends of which are lugs or joints which are fitted to and receive the shaft ends or pole bracket ends, the joints being above the springs. The improved construction, which is applicable to buggies and other four-wheeled road vehicles, is designed to obviate a great deal of friction, wear and rattle.

VEHICLE CURTAIN.—Frank Lane, Newark, Ohio. For buggies, phaetons and similar top carriages, this invention provides a curtain arranged to be easily and quickly operated to open or close the sides of the vehicle, the improvement comprising a tubular casing or socket in which is journaled a spring-pressed roller carrying the curtain.

THILL COUPLING.—Frank W. Warner, Angelica, N. Y. This coupling has a clip plate with transverse slotted socket in which is held the shank of the thill iron, screw bolts across the ends of the socket bearing on the ends of the shank. The clip plate is formed of a single piece of sheet metal having one end wider than the other, the opposite sides of the wider end having opposite wings oppositely perforated.

TRUSS.—Joseph Fandrey, Santa Barbara, Cal. This is a device for the support and reduction of hernia, and designed to be specially adapted for the cure of abdominal ruptures, while being easy to wear and not liable to shift from its position.

Designs.

PUMP CASING.—Aquila B. Marshall, New York City. This design shows a casing especially designed for a bicycle air pump, and having a cylindrical portion and a broadened end.

BADGE.—Charles A. Barker, New York City, and Frederick L. Green, Long Island City, N. Y. This design simulates an elephant in profile and in front view, while a spur from the back forms a support.

CHRISTMAS TREE ORNAMENT.—Victor A. De Prosse, San Francisco, Cal. This design affords a decoration made to represent a conventional flower or lily.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

PHOTOGRAPHY: ITS MATERIAL AND APPLIANCES. With some remarks for the use of non-proficients on their choice and application. London: John Birch & Company, Limited. 1895. Quarto. Pp. 140. Profusely illustrated. Price $3.

This work is issued for circulation in foreign countries and especially in the British colonies, and is issued by the well known firm of merchants and engineers, who do a large commission and manufacturing business. The first part of this work is devoted to descriptions of photographic apparatus and directions and formulas for working various processes. The second part is devoted to a priced catalogue of photographic apparatus. It is rather extraordinary to make buyers pay for a trade catalogue; it is, however, an English custom. The reading matter in the front occupies only 128 pages and is hardly worth the price charged—seven shillings and sixpence.

AMERICAN STEAM AND HOT WATER HEATING PRACTICE. New York: The Engineering Record. 1895. Pp. 317. Large 8vo. Profusely illustrated. No index. Price $4.

This is a selected reprint of important articles which have appeared in the Engineering Record, a journal of

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high standing. The present work, which is sure of a large sale, is intended to supplement "Steam Heating Problems," which was published in 1888. The new volume includes a description of some of the best expositions of heating and ventilating design as applied to modern structures of the most extensive kind, as well as a description of various problems arising in this department of building engineering. The book is profusely illustrated with large scale plans and details of some of the best known installations in the United States, and includes work done in the ordinary residence up to the largest and most expensive plant for heating public buildings and churches. The work can be especially commended for the excellence of these plans, which seem to leave nothing to be desired. It is to be regretted, however, that an index was not provided, for even the very full table of contents does not take the place of an index, with which all scientific and technical books should be provided.

PHYSIOLOGY. By A. Macalister, LL.D., M.D. London: Society for Promoting Christian Knowledge. 1895. Pp. 123. 18mo. 59 illustrations. Price 40 cents.

This book belongs to the "Manuals of Elementary Science" series. The author has endeavored to present in a simple and concise form some of the elementary principles of the physiology of man. As the space at disposal is small, the author has selected such portions of the subject as are calculated to be of use to the general reader who is desirous to possess an intelligent appreciation of the nature of the parts of the body and their several functions.

HOW TO STUDY STRANGERS BY TEMPERAMENT, FACE AND HEAD. By Nelson Sizer. New York: Fowler & Wells Company. 1895. Pp. 380. 8vo. 300 illustrations. Price $1.50 in cloth, paper 70 cents.

The author of this work has for more than half a century been engaged in the study of human character, and as the result of such long and varied experience has produced a book the object of which is to teach one how to read the character of the stranger or the friend. It is eminently practical in its teachings, simple and pointed in its language. The three leading features of the book are: I. The Analysis and Illustration of the Human Temperaments. II. Child Culture. III. Character Studies.

REPORT OF THE BOARD OF LIBRARY COMMISSIONERS OF NEW HAMPSHIRE. December 1, 1894. Concord, N. H. 1894. Pp. 77, 8vo.

SCIENTIFIC AMERICAN

BUILDING EDITION.

DECEMBER, 1895.—(No. 122.)

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1. Elegant plate in colors showing a residence in the Colonial style recently erected at East Orange, N. J., at a cost complete of $14,000. Three perspective elevations and floor plans, also an interior view. An excellent design well treated. S. W. Whittemore, architect, East Orange, N. J.
2. A Colonial house at Madison, N. J. Perspective elevation and floor plans. Cost complete $5,500. Architects, Messrs. Child & De Goll, New York City.
3. A Colonial dwelling at Montclair, N. J. Two perspective elevations and floor plans. Architect, W. E. Bloodgood, New York City. A unique design.
4. Two perspective elevations and floor plans of a house recently erected at Brick Church, N. J., at a cost of $2,700 complete. A pleasing design. Architect, Mr. F. R. Hassman, Orange, N. J.
5. View of the new City Hall, Philadelphia, which has been erected at a cost of over $20,000,000. The building is of white marble and covers four and a half acres. Is absolutely fireproof. The height of this building is 547 feet 3⅛ inches, being, with two exceptions, the highest building on the earth. The exceptions being the Washington Monument and the Eiffel Tower. The next highest building on earth is the Cologne Cathedral, which is 510 feet.
6. View of the facade of the magnificent new Boston Public Library, Boston. Architects, Messrs. McKim, Mead & White, New York City.
7. Residence at Bensonhurst-by-the-Sea, L. I. Two perspective elevations and floor plans. Cost complete, $8,500. Architect, S. S. Covert, New York City.
8. Perspective elevations and floor plans of a cottage at Oakwood, S. I., recently erected at a cost of $2,800 complete. An attractive design.
9. Miscellaneous Contents: Testing house pipes and drains.—A combination bathtub and washstand, illustrated.—The permanence of modern dwellings and public works.—An improved steam and hot water heater, illustrated.—Moving a large factory.—How to fix paper on drawing boards.—A quick water heater, illustrated.—Improved toilet room fixtures, illustrated.—A single track parlor door hanger, illustrated.—An improved furnace grate, illustrated.—Cements in mason work.—An improved furnace, illustrated.—A regenerative gas heater, illustrated.—Improved woodworking machinery, illustrated.

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References to former articles or answers should give date of paper and page or number of question.

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(6671) W. B. McP. asks: 1. Is there any foundation for the theory of getting better health by sleeping with the head to the north? If so, why? A. It is doubtful if any particular benefit is derived from sleeping with the head to the north. Yet it has been asserted by nervous people that a difference was noticeable in their temper and composure with changes of sleeping position in regard to the magnetic polarity of the earth. 2. Where can I get the glass tubes, retorts and other implements necessary for a few simple experiments in chemistry? Is there any firm that manufactures them that issues a catalogue? A. Address Eimer & Amend, Third Avenue and Eighteenth Street, New York, for catalogue of chemical furniture and supplies.

(6672) W. F. C. writes: When steam boilers are full of water, is it possible to raise the temperature and pressure to a dangerous degree? If not, the water jackets surrounding gas engine cylinders might be filled in a similar way and the necessity of maintaining a continuous circulation of cold water avoided. A. There is danger in heating a closed boiler full of water. The expansion of the water would rupture the boiler if there were no safety valve. It is a common practice to use an iron open tank filled with water and connected with the water jacket of a gas or gasoline engine in such way that a continuous circulation of water through the cylinder jacket takes place, the large surface of the iron tank being sufficient for keeping the water cool.

(6673) J. W. says: I want to know what is the best way to keep the windows in a store from sweating and spoiling the goods. A. To keep frost, etc., off plate glass windows, keep the inside air dry, or inner sash tight, so that the air in window inclosure will be cold, and ventilated from the outside. A partial remedy is to have ventilating openings in the top of the window casing. A thin coat of pure glycerine applied to both sides of the glass will prevent any moisture forming thereon, and will stay until it collects so much dust that it cannot be seen through. Surveyors can use it to advantage on their instruments in foggy weather. In fact, it can be used anywhere to prevent moisture from forming on anything, and locomotive engineers will find it particularly useful in preventing the accumulation of steam as well as frost on their windows during the cold weather.

(6674) N. B. W. asks: 1. What is the best proportion of air and gasoline vapor for a gasoline engine? A. 25 to 40 volumes, according to the composition of the gasoline. 2. At what temperature will it explode? A. At a full red heat, say 2000° Fah. 3. Describe Tesla's electric motor. A. See our SUPPLEMENT, Nos. 692, 944, 1025.

(6675) H. A. W. asks how to make French mustard. A. The following is M. Lenormand's recipe: Flour of mustard, 2 lb.; fresh parsley, chervil, celery and tarragon, of each ½ oz; garlic, 1 clove (or head); 12 salt anchovies (all well chopped); grind well together, add salt, 1 oz.; grape juice or sugar to sweeten, and sufficient water to form the mass into a thin paste by trituration in a mortar. When put into pots a red hot iron is momentarily thrust into the contents of each, and a little wine vinegar added.

(6676) H. J. T. asks how to make gelatine capsules. A. Dissolve in a water bath 10 parts of gelatine, 2½ parts of sugar, 1¼ parts of gum arabic in 10 parts of water. Take iron pins, the lower ends of which are pear-shaped and slightly oiled, dip in this solution when it is lukewarm. When the gelatine films are congealed, detach them, and place in holes of the same size in wooden forms, to dry. The capsules are filled with the desired medicine and closed with a drop of the same solution.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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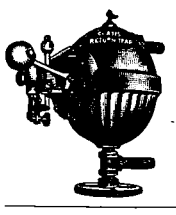

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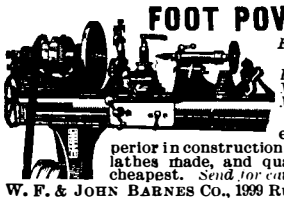

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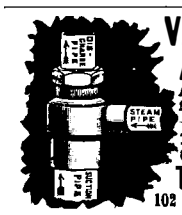

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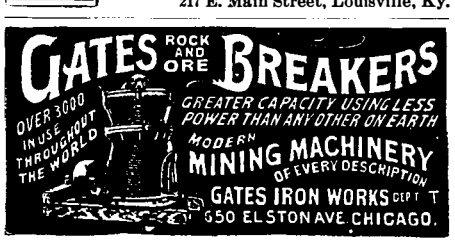
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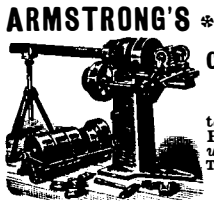

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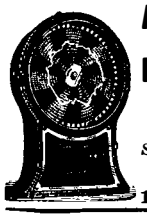

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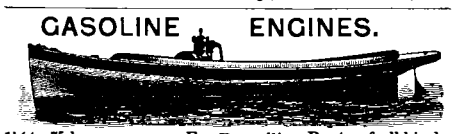

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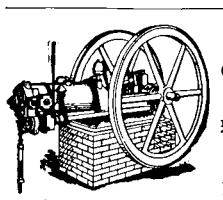

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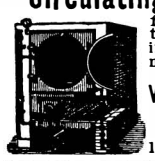

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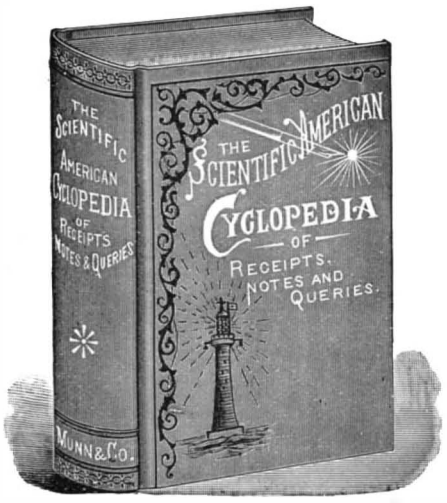

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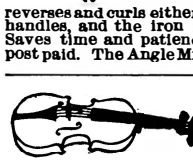

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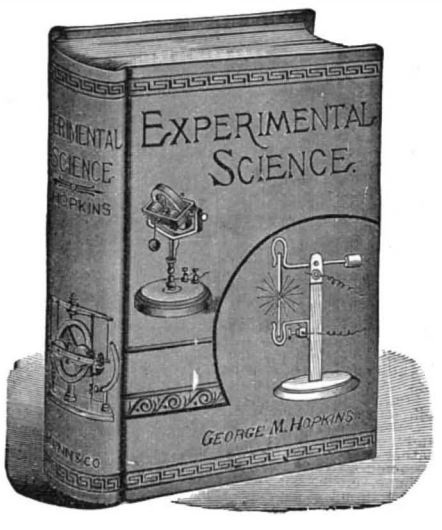

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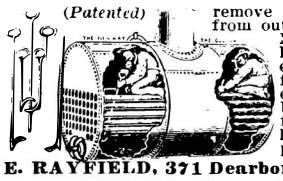

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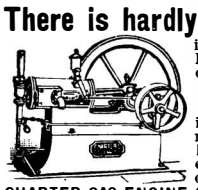

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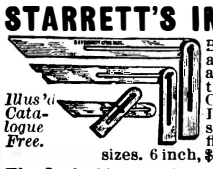

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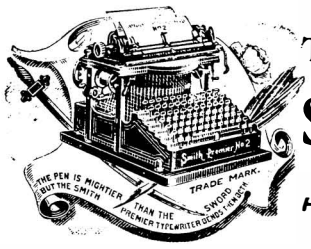

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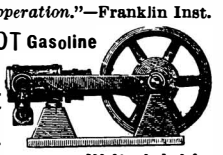

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